Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Restoring Internet Freedom	)	WC Docket No. 17-108

Declaration of Mark A. Israel, Allan L. Shampine & Thomas A. Stemwedel

July 17, 2017

Table of Contents

I. Qualifications

A. Mark A. Israel

1. My name is Mark A. Israel. I am a Senior Managing Director at Compass Lexecon, an economic consulting firm where I have worked since 2006. From 2000 to 2006, I served as a full-time member of the faculty at Kellogg School of Management, Northwestern University. I received my Ph.D. in economics from Stanford University in 2001.

2. I specialize in the economics of industrial organization – which is the study of competition in imperfectly competitive markets, including the study of antitrust and regulatory issues – as well as applied econometrics. At Kellogg and Stanford, I taught graduate-level courses covering topics including business strategy, industrial organization economics, and econometrics. My research on these topics has been published in leading economics journals including the American Economic Review, the Rand Journal of Economics, the Review of Industrial Organization, Information Economics and Policy, and Antitrust Source.

3. My work at Compass Lexecon has focused on the application of economic theory and econometric methods to competitive analysis of the impact of mergers, antitrust issues including a wide variety of single-firm and multi-firm conduct, class certification, and damages estimation. I have testified in Federal court and in many regulatory and arbitration proceedings in the U.S. and around the world, and submitted expert reports, declarations, and affidavits to government agencies and Federal courts on behalf of a wide range of clients.

4. My work has involved a range of industries including wireless telecommunications, broadband Internet access, and cable television, as well as other high technology industries, airlines, railroads, beverage distribution, retail, financial markets, pharmaceuticals, and publishing. I have been involved in many recent transactions and proceedings in the telecommunications industry, including the proposed AT&T/T-Mobile merger, the AT&T/Time Warner merger, the T-Mobile/MetroPCS merger, the AT&T/Leap merger, the SpectrumCo transaction, and Federal Communications Commission proceedings on wireless spectrum auctions. A copy of my curriculum vitae is included as Appendix A.

B. Allan L. Shampine

5. My name is Allan L. Shampine. I am an Executive Vice-President of Compass Lexecon, an economic consulting firm. I received a B.S. in Economics and Systems Analysis *summa cum laude* from Southern Methodist University in 1991, an M.A. in Economics from the University of Chicago in 1993, and a Ph.D. in Economics from the University of Chicago in 1996. I have been with Compass Lexecon since 1996.

6. I specialize in applied microeconomic analysis with a particular focus on technological innovation. I am the editor of the book Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies, and I have published a variety of articles on the economics of telecommunications and network industries, as well as patents, technology diffusion and antitrust issues. I am an editor of the American Bar Association journal Antitrust Source.

7. I have worked on telecommunications matters throughout my career, and have submitted testimony concerning the regulation of telecommunication and broadband networks in multiple countries. I have previously provided economic evidence to the United States Federal Communications Commission, International Trade Commission, state public utility commissions, Federal Maritime Commission, United States district court, European Commission, Korean Fair Trade Commission, Chinese National Development & Reform Commission, Info-Communications Development Authority of Singapore, and the Australian Competition & Consumer Commission. A copy of my curriculum vitae is included as Appendix B.

C. Thomas A. Stemwedel

8. My name is Thomas A. Stemwedel. I am an Executive Vice President at Compass Lexecon, an economic consulting firm, where I have been employed since 1994. I specialize in Industrial Organization economics, which is the study of the structure of firms and markets, and is the branch of economics that deals with antitrust and regulatory issues. I received my Bachelors and Masters degrees from the University of Chicago.

9. Over the course of my career, I have consulted on a variety of complex telecommunications matters in litigation, merger review and regulatory contexts, and am a co-author of "Econometric Analysis of Telephone Mergers," in the American Bar Association's Econometrics: Legal, Practical and Technical Issues. A copy of my curriculum vitae is included as Appendix C.

II. Overview and summary of conclusions

A. Overview

10. In its recent Notice of Proposed Rulemaking ("NPRM"), the Federal Communications Commission ("Commission") has asked for comments on its proposal to reclassify broadband Internet access services as an "information service" and thereby end the regulation of these services under Title II of the Communications Act.[1] Doing so would eliminate common carriage regulation of broadband services as well as the "Internet Conduct Standard" that the Commission adopted in the Title II Order.[2]

11. As one prominent part of the NPRM, the Commission has invited a cost-benefit analysis of Title II regulation.[3] In this Declaration, we respond to the NPRM by providing an economic analysis of the costs and benefits of Title II regulation of broadband Internet access services. In conducting our analysis, we assume not only that antitrust laws will still apply to broadband, but also that the no-blocking, no-throttling, and transparency rules will continue to be in place, as

1. Federal Communications Commission, In the Matter of Restoring Internet Freedom Notice of Proposed Rulemaking, FCC 17-60, May 23, 2017 ("NPRM"), pp. 30-32. See also Federal Communications Commission, Report and Order in the Matter of Preserving the Open Internet Broadband Industry Practices, FCC 10-201, December 23, 2010 ("2010 Order"); and Federal Communications Commission, In the Matter of Protecting and Promoting the Open Internet Report and Order on Remand, Declaratory Ruling, and Order, FCC 15-24, March 12, 2015 ("Title II Order").

2. More specifically, the Title II Order found that broadband Internet access service was subject to the core common carrier provisions of the Communications Act, sections 201 and 202, along with the Communication Act's enforcement provisions, section 208. Title II Order, ¶¶ 29, 53.

3. NPRM, ¶ 105.

these rules are generally supported even by the broadband providers that would be regulated by them. Given this baseline, we focus our analysis on the *incremental* costs and benefits of Title II regulation.

12. On the benefit side of the ledger, we focus on whether there are significant market failures that additional regulation might correct, or, instead, whether there is effective competition. On the cost side of the ledger, we consider some (but not all) of the costs of incremental Title II regulation, focusing our attention on the impact of regulation on investment.[4] We focus on investment both because of the well-known adverse impact of regulatory uncertainty and regulatory creep on investment incentives, and also because the Title II Order explicitly focused on the role of spurring investment in the "virtuous cycle" of consumer benefits.[5]

13. *Our conclusion is simple: Even considering only one subset of the costs, the costs of imposing Title II regulation greatly outweigh any plausible benefits. On this basis, we support the Commission's proposals in the NPRM. We provide more details underlying this conclusion in the following paragraphs.*

B. Lack of benefits from Title II regulation

14. We conclude that there are no compelling benefits from Title II regulation given current marketplace conditions. Most fundamentally, this conclusion follows from our finding – detailed below – that the broadband Internet access marketplace is effectively competitive today and is becoming even more competitive, including due to wireless and wireline convergence. Competition is a powerful (if sometimes imperfect) force for ensuring economic efficiency and maximizing social welfare. Hence, it is generally accepted among economists that, in the

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4. To the extent that there are other significant economic costs of Title II regulation, by focusing only on the impact of regulation on investment, our analysis of the costs and benefits of Title II regulations is conservative.

5. See Title II Order, ¶ 2 ("[T]he Commission adopted open Internet rules to protect and promote the 'virtuous cycle' that drives innovation and investment on the Internet – both at the 'edges' of the network, as well as in the network itself.")

presence of effective competition, there is a diminished need for regulation and firms otherwise should generally be allowed to compete freely and thereby achieve the benefits that competition brings to consumers.[6]

15. In showing the lack of incremental benefits from Title II regulation above and beyond baseline no-blocking, no-throttling, and disclosure rules, we **first** show that there is effective competition in the provision of wireless broadband Internet access service. In particular, we find that all of the commonly-used indicia of effective competition that economists typically look at are present for wireless service. There are many existing wireless providers (as well as new entrants), all of whom compete fiercely to attract customers through aggressive promotions and pricing. Consistent with the direct evidence of intense competition, metrics of wireless prices have fallen over recent years, while network quality and speed have increased. Additionally, there are low barriers to switching, particularly given the declining importance of long-term contracts between carriers and subscribers. The magnitude of switching is demonstrated by the fact that each quarter over 16 million subscribers disconnect from AT&T, Sprint, Verizon, T-Mobile and US Cellular. And equally important, the credible *threat* by a consumer to switch, whether or not it is carried out, causes wireless carriers to quickly mimic one another's improvements in offerings (such as unlimited plans) and to offer substantial incentives to convince consumers not to depart.

16. **Second**, we find that the indicia of effective competition are also present in the provision of wireline broadband Internet access services. Customers have choices among wireline broadband providers, who compete fiercely for subscribers. Wireline speeds continue to

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6. Here, our views are consistent with various Congressional statements regarding telecommunications policy. For example, in the Telecommunications Act of 1996, Congress amended the Communications Act in order to "promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies." Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56, at 1. See also Section 47 USC 230, added to the Communications Act by the Telecommunications Act of 1996, indicating that the Internet has flourished with a minimum of regulation and setting forth a goal to preserve "the vibrant and competitive free market" "unfettered by Federal or State regulation."

increase, and wireline providers spend heavily on competitive advertising, belying claims that their consumers are locked in or that they face no meaningful competition. Customers can and do switch between providers, and the mere threat of switching often forces providers to reduce prices or improve offerings to retain customers. We also note that, following the same logic as advanced in the Commission's recent findings in the Business Data Services proceeding, large sunk costs in networks and customer acquisition lead to intense rivalry even in areas with only two wireline providers.

17. **Third**, wireless and wireline services are rapidly converging, further increasing the number of competitive options available to consumers. More customers are cutting the cord and using only wireless services for voice and data needs, in part because of the increased speeds of wireless networks. As the industry transitions to 5G technology in the future, this convergence will only increase, with further expansion in the importance of wireless offerings as full substitutes for wireline Internet access. Notably, while it is true that this convergence is in progress and not yet complete, sound regulatory policy must be forward looking in order to meet the needs of industry participants and consumers in the years to come, without the need for frequent, costly, and disruptive regulatory revisions. Hence, convergence is highly relevant to policy discussions today, both because it is already occurring and because it will accelerate in the future.

18. **Fourth,** we find no evidence of specific market failures that would justify common carrier regulation beyond the baseline of no-blocking, no-throttling, and transparency rules. For example, claims that broadband providers have "terminating access monopoly" power are simply incorrect: Broadband Internet access providers are not monopolists; they do not behave like monopolists, and the conditions that historically gave rise to terminating access monopoly concerns in telecom markets – which were actually the *result* of regulatory intervention – do not apply here. Nor do "externality" concerns justify common carrier regulation of broadband Internet access. Instead, broadband Internet providers internalize most externalities (meaning they are not a problem) in their role as platforms between edge providers and consumers; examples of externalities that have been advanced do not hold up to scrutiny; and, additional regulation would be more likely to create externality problems than solve them.

19. In sum, the growing competitiveness of the broadband Internet access marketplace justifies a return to "light-touch" regulation, under which competition can thrive, rather than Title II regulation that would stifle competition. If significant concerns were to arise in the future because of diminished competition in the broadband marketplace, antitrust laws, along with no-blocking, no-throttling and transparency rules, provide a backstop without the competition-subverting effects of full Title II regulation.

C. Significant harms from regulation

20. On the other side of the ledger, the likely costs associated with Title II regulation of broadband Internet access are enormous, even when considering only effects on investment.[7] As a general matter, economists recognize that regulations can subvert the competitive process and impose significant costs and thus should not be applied without compelling evidence that the likely benefits of the proposed regulations outweigh those costs. In particular, well-established

7. Economists have recognized for many years that the economic benefits of broadband to the economy are enormous. For example, even in 2003, Robert Crandall of the Brookings Institution (with Charles Jackson) estimated that broadband was already creating many billions of dollars of benefits and would soon be generating hundreds of billions of dollars of benefits. Robert Crandall & Charles Jackson, "The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access," in Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies, Allan Shampine (ed.), Nova Science Press (2003). Similarly, an International Telecommunications Union white paper on broadband reported that firms have invested hundreds of billions of dollars in broadband networks, broadband in the United States creates hundreds of thousands of jobs, and broadband substantially increases GDP. The paper also emphasizes that "the impact of broadband is neither automatic nor homogeneous" and "emphasizes the importance of implementing [appropriate] public policies…" International Telecommunications Union, "Impact of Broadband on the Economy," Broadband Series, April 2012. Similarly, Hal Varian, chief economist at Google, estimated the value of Internet search engine use alone at $1.37 per day per adult worker, or over $100 billion per year for the United States. Hal Varian, "The value of the internet now and in the future," The Economist, March 10, 2013. While measuring productivity and consumer surplus can be difficult, there is no doubt that broadband Internet services are an important part of the economy today, and regulatory changes that impact broadband Internet services will in turn have important effects on the economy.

economic theory recognizes that regulatory uncertainty and regulatory creep can have strong negative effects on investment.

21. In the present case, these investment and innovation suppressing effects are particularly severe because the regulatory regime imposed in the Title II Order substantially increases regulatory uncertainty and regulatory creep. In particular, by imposing the core common carrier requirements of Title II (sections 201 and 202), the Title II Order went far beyond the Commission's historical "light-touch" approach, thus creating great uncertainty about the regulatory approach going forward. In particular, sections 201 and 202 broadly prohibit "unreasonable" and "discriminatory" practices, with no historical precedent for how these broad concepts apply to modern Internet services, creating great uncertainty going forward. Making things worse, the Internet Conduct Standard, which the Title II Order characterizes as the application of sections 201 and 202 to the Internet, expressly gives the Commission the authority to condemn any conduct deemed to be "unfair," leaving uncertain how such a determination might be made. Indeed, the vague criteria adopted in the Internet Conduct Standard give the Commission exactly the sort of ill-defined, broad-sweeping authority to prohibit any practices deemed to hinder access to the Internet that has been shown to create substantial investment-chilling uncertainty. Finally, the process through which Title II regulation was arrived at – starting in 2005 with a focus on no-blocking and no-throttling rules and proceeding through imposition of vague common carrier regulation in the 2015 Title II order – demonstrates the reality of "regulatory creep," through which regulations expand over time, creating further investment chilling uncertainty.

22. As a matter of economics, such regulatory uncertainty and regulatory creep will depress incentives to make investments that would otherwise improve broadband networks to the benefit of both consumers and edge providers. A well-established body of theoretical and empirical economic literature establishes that regulatory uncertainty and creep generally, and Title II regulation specifically, dampen investment incentives. We conclude that Title II regulation already has imposed substantial costs on marketplace outcomes due to reduced investment incentives. While we recognize that industry participants currently invest, both investment and competition would be greater – and customers would be better off – without Title II regulation.

23. Our concerns about regulatory uncertainty and regulatory creep are highlighted by the Commission's recent investigation of AT&T's zero-rating practices and Staff's preliminary conclusion that AT&T had violated the Title II Order's "net neutrality" regime. This preliminary conclusion is striking, not only in that it calls for exactly the sort of direct rate regulation that the Commission had indicated it would forbear from, but even more so in that it condemns a pro-consumer price cut that would reduce consumer's data costs by exempting some content from data limits. The logic advanced by the Commission in this preliminary conclusion was without economic rigor and specificity, demonstrating how the Internet Conduct Standard can be applied broadly and arbitrarily – including to condemn pro-consumer price reductions – rendering it all the more unpredictable. Indeed, the fact that zero-rating policies could be deemed a violation of the regulation naturally leaves providers uncertain whether *any* actions that differentiate their offerings – particularly actions that work with edge providers to promote their Internet services – will be deemed violations of the Internet Conduct Standard.

24. In sum, we find that any benefits from Title II classification are *de minimis* and largely speculative, while the likely costs of this regulation in terms of its impact on investment are enormous. Hence, we conclude that the costs of Title II regulation of broadband Internet access service exceed any potential benefits.

III. Lack of benefits from Title II regulation: Effective competition makes common carrier regulation unnecessary.

A. Overview

25. A fundamental tenet of economics is that competition produces economically efficient outcomes and enhances social welfare. Therefore, it is generally accepted among economists that, in the absence of clear evidence to the contrary, the actions of competitive firms (even though self-interested) generally promote social welfare and efficiency and that sound regulatory policy should therefore be designed to promote competition because of the benefits that

competition can be expected to bring to consumers.[8] Indeed, the Department of Justice, in its comments on the Commission's 2010 net neutrality proceeding, warned that "[a]lthough enacting some form of regulation to prevent certain providers from exercising monopoly power may be tempting with regard to… areas [served by only one or two providers], care must be taken to avoid stifling the infrastructure needed to expand broadband access. In particular, price regulation would be appropriate only where necessary to protect consumers from the *exercise of monopoly*."[9]

26. Thus, while certain forms of regulation can have substantial benefits in some specific circumstances – such as where marketplace conditions only support a single provider *(i.e.*, the industry is a natural monopoly) or where regulation is designed only to help the competitive process function smoothly, such as by improving access to information – Title II regulation of broadband Internet access does not fit into these categories.[10] It is also important to stress that there is a broad consensus that disclosure requirements and prohibitions on blocking and throttling should remain in place. The question here is whether Title II regulation should be imposed in addition to this baseline regulation and applied to an otherwise effectively competitive marketplace. We conclude that such incremental regulation serves only to constrain the competitive options open to firms while offering little or no incremental benefit. As such, in light of the significant costs of regulatory uncertainty and regulatory creep discussed in detail below, Title II regulation should not be retained.

27. In this section, we establish that there are minimal benefits from incremental Title II regulation. **First**, we establish that both the wireless and wireline broadband Internet access

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8. See, for example, Dennis Carlton & Jeffrey Perloff, Modern Industrial Organization, 4th Edition, Addison Wesley (2005), and Alfred Kahn, The Economics of Regulation: Principles and Institutions, MIT Press (1970).

9. U.S. Department of Justice, Ex Parte Submission to the FCC, Docket No. 09-51, January 4, 2010, p. 28 (emphasis added).

10. Perfect competition is not the benchmark for determining whether regulation is warranted or in antitrust. Rather, the standard is whether there is a sufficient degree of competition to discipline firms that attempt consumer unfriendly actions and to push prices toward the competitive rate of return.

markets are effectively competitive. We do so by considering certain basic factors that economists commonly consider when examining whether an industry is effectively competitive.[11] Specifically, a rigorous analysis of whether there is "effective competition" should ask: 1) do consumers have a choice among vendors; 2) is there overt rivalry for consumers; 3) do vendors have the ability to accommodate new customers; and 4) do customers have the ability to switch between vendors?[12] As we will describe below, with regard to both wireless and wireline Internet access today, *all* of these indicators of effective competition are present, indicating that competition is functioning well, and there is little likelihood of market failure that would necessitate incremental regulation beyond the baseline.

28. **Second**, we explain that any consideration of regulatory policy is appropriately forward looking, assessing competitive conditions over several years, so that regulation does not need to be changed frequently in response to changing conditions, which would worsen the problems of regulatory uncertainty and opportunism. In the present context, this means that one should consider the ongoing convergence of wireline and wireless broadband services, which will increase competition and thus further reduce any possible need for Title II regulation.

29. **Third**, we explain why the other supposed "benefits" of Title II regulation that have been raised also do not survive scrutiny. There are no "market failures" here that need to be addressed by common carrier regulation. In particular, concerns raised in the Title II Order, such as the supposed existence of a "terminating access monopoly" and of "externalities," are not economically sound and do not justify the significant costs created by Title II regulation and the

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11. These factors are summarized in a recent article by Profs. Delp and Mayo that surveys the economic literature and history of Commission practice with respect to defining "effective competition." See Amanda Delp & John Mayo, "The Evolution of 'Competition': Lessons for 21st Century Telecommunications Policy," 50 Review of Industrial Organization (2017). See also Dennis Carlton & Jeffrey Perloff, Modern Industrial Organization, 4th Edition, Addison Wesley (2005), Chapters 6 and 7; and Luis Cabral, Introduction to Industrial Organization, MIT Press (2000), Chapter 7.

12. Amanda Delp & John Mayo, "The Evolution of 'Competition': Lessons for 21st Century Telecommunications Policy," 50 Review of Industrial Organization (2017), at 411. We note that not every indicium needs to point strongly in the direction of competition for a market to be effectively competitive. Even if there substantial variation in the individual indicators of competition, an industry can still be effectively competitive.

Internet Conduct Standard above and beyond prohibitions on blocking and throttling, and transparency. Indeed, as we discuss below, historical "terminating access monopoly" concerns were actually created by access regulation.

30. **Finally**, we explain that the alternative to Title II common carrier regulation is not no regulation. As noted above, there is a general consensus in the industry that the no-blocking, no-throttling and transparency rules should be maintained. In addition, generally applicable antitrust laws will continue to apply. To the extent there are any cases in which competition does not function effectively, or any specific instance of significant market failures, they would be addressed by a combination of no-blocking, no-throttling, and transparency rules, together with antitrust laws. The combination of these regulations and laws provides a backstop to bolster competition, rather than a sweeping set of common carrier regulations that would tend to undermine it.

B. There is significant competition for wireless broadband Internet access services.

1. Consumers have many choices among wireless broadband Internet access providers.

31. As explained in detail in AT&T's comments in the wireless competition proceeding,[13] consumers have numerous options in the marketplace. There are four national facilities-based providers (AT&T, Sprint, T-Mobile and Verizon) and many regional and local facilities-based providers, including U.S. Cellular, C Spire, Alaska Wireless, Bluegrass Cellular, Carolina West Wireless, Cellcom, Choice Wireless, Nex-Tech Wireless, Pioneer and Sagebrush Cellular.[14]

32. In addition to the established facilities based providers, there are important new facilities-based entrants into the provision of wireless services. For example, in April 2017, Comcast announced that it was introducing wireless service under the Xfinity brand. The service

13. Comments of AT&T Inc., in the Matter of the State of Mobile Wireless Competition, WT Docket No. 17-69, May 8, 2017.

14. 19th CMRS Report, ¶¶ 7-8.

will take advantage of Comcast's own infrastructure facilities, including more than 16 million Wi-Fi hotspots, and will be supplemented by Comcast's MVNO agreement with Verizon.[15] Also, in May 2017, Comcast and Charter announced a partnership "to accelerate and enhance each company's ability to participate in the national wireless marketplace."[16] As explained by investment analyst New Street Research at the time of the announcement:[17]

> A new entrant with deep pockets and with a near-national fiber footprint is obviously not good for wireless carriers in an already competitive market… We think that cable companies could easily capture close to 20% of their addressable market over the course of the next five years. This would exacerbate sub[scriber] losses for AT&T and Verizon, who still control roughly 60% of the retail market and an even greater share of the subs[cribers] that Cable will be targeting.

Also, in 2016, Google launched its wireless service, Project Fi, which uses Wi-Fi and MVNO services from Sprint and T-Mobile for its network.[18]

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15. Edward Baig, "Comcast unveils wireless service, Xfinity Mobile, for $45-$65 a month," USA Today, April 6, 2017, https://www.usatoday.com/story/tech/columnist/baig/2017/04/06/comcast-unveils-wireless-service-xfinity-mobile-45-65-month/100113234/.

16. Comcast Press Release, "Comcast, Charter to Explore Operational Efficiencies to Speed Entry into Wireless Market," May 8, 2017, http://corporate.comcast.com/news-information/news-feed/comcast-charter-wireless-efficiencies.

17. Colin Gibbs, "Comcast, Charter partner to enter the wireless market," FierceWireless, May 8, 2017, http://www.fiercewireless.com/wireless/comcast-charter-partner-to-enter-wireless-market. See also UBS, "Here come the cable MVNOs," May 30, 2017 ("Comcast and Charter separately activated their MVNO rights with Verizon and will now work together to stand up their respective offerings. Comcast is already selling service under its Xfinity brand and Charter is set to follow in 2018 (although, with the establishment of this collaboration, we think its entry could now come sooner). The new entity should be able to market to ~115M homes, or roughly 97% of the U.S. market. We believe this agreement will enable the MSOs to establish a more formidable wireless entity on a shorter timeframe than would have been possible had these providers gone at it alone. This will add intensity to an already competitive wireless market.")

18. Parmy Olson, "The Experiment Is Over: Google Opens Its Project Fi Wireless Service To All," Forbes, March 8, 2016, https://www.forbes.com/sites/parmyolson/2016/03/08/google-opens-project-fi-wireless-service-to-all/#4df35621512b.

33. Publicly available data confirm that consumers have multiple high quality choices for wireless broadband Internet access services. For example, LTE services from Verizon, AT&T, T-Mobile and Sprint are essentially ubiquitous. Verizon states that its LTE network covers 98% of the U.S. population,[19] with average LTE speeds of over 21 Mbps in the first half of 2016;[20] AT&T states that its LTE network covers 317 million people, or roughly 97% of the U.S. population,[21] with average LTE speeds of over 20 Mbps in the first half of 2016;[22] T-Mobile states that its LTE networks covers 314 million people and will cover 321 million by year end 2017,[23] with average LTE speeds of over 22 Mbps in the first half of 2016;[24] and Sprint states that its LTE coverage is only slightly behind,[25] with average LTE speeds of over 15 Mbps in the first half of 2016.[26] In addition, over 60 MVNO-based providers offer LTE service, including Virgin Mobile, Boost and TracFone.[27]

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19. Verizon web site, "Better keeps you covered with the next gen network: 4G LTE Advanced," https://www.verizonwireless.com/featured/better-matters/.

20. United States Speedtest Market Report, Ookla, August 3, 2016, http://www.speedtest.net/reports/united-states/ . According to Ookla, approximately 98% of Verizon Wireless' speed tests occurred over their LTE network.

21. AT&T web site, "LTE Advanced outperforms 4G LTE," https://www.att.com/offers/network.html.

22. United States Speedtest Market Report, Ookla, August 3, 2016, http://www.speedtest.net/reports/united-states/ . According to Ookla, approximately 93% of AT&T's speed tests occurred over their LTE network.

23. T-Mobile, http://investor.t-mobile.com/Cache/1001222980.PDF?O=PDF&T=&Y=&D=&FID=1001222980&iid=4091145.

24. United States Speedtest Market Report, Ookla, August 3, 2016, http://www.speedtest.net/reports/united-states/ . According to Ookla, approximately 95% of T-Mobile's speed tests occurred over their LTE network.

25. Chris Holmes, "Who Has the Best Coverage?" WhistleOut, June 20, 2017, https://www.whistleout.com/CellPhones/Guides/who-has-the-best-coverage.

26. United States Speedtest Market Report, Ookla, August 3, 2016, http://www.speedtest.net/reports/united-states/. According to Ookla, approximately 93% of Sprint's speed tests occurred over their LTE network.

27. https://en.wikipedia.org/wiki/List_of_United_States_mobile_virtual_network_operators

2. There is intense rivalry between wireless broadband Internet access providers.

34. Wireless providers aggressively pursue one another's customers. In recent years, these efforts have been especially intense as both T-Mobile and Sprint have been winning customers at a rapid pace. For example, T-Mobile has been very successful in winning customers from rivals, having added over one million net subscribers every quarter for the past four years.[28] And Sprint reports that it has had ten consecutive quarters of year-over-year improvement in subscriber additions.[29] Meanwhile, Verizon and AT&T have been losing customers to their rivals.[30]

35. This competitive rivalry is apparent in providers' competitive promotional behavior. Competitive promotional behavior has been intense in recent months, with aggressive promotions of unlimited data plans resulting in significant shifts of customers between carriers, with, as noted above, Verizon and AT&T losing customers to their rivals. Examples of such promotions include:

- Within the last few weeks Sprint has begun offering a free year of unlimited data for people who switch.[31]

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28. T-Mobile, 1Q 2017 Investor Factbook, http://investor.t-mobile.com/Cache/1001222980.PDF?O=PDF&T=&Y=&D=&FID=1001222980&iid=4091145.

29. Sprint, Fiscal 4Q 2016 Earnings Release, http://s21.q4cdn.com/487940486/files/doc_financials/quarterly/2016/Q4/1-Fiscal-4Q16-Earnings-Release-FINAL.pdf.

30. See, for example, Ryan Knutson & Joshua Jamerson, "Verizon Customers Defect as Competition Ramps Up," The Wall Street Journal, April 21, 2017; The Associated Press, "Amid Competition, Verizon Loses Key Customers for the First Time," The New York Times, April 20, 2017; and Roger Cheng, "T-Mobile's all-in bet on unlimited pays off," CNET, April 24, 2017.

31. Jeff Dunn, "Sprint is offering an aggressive deal," Business Insider, June 13, 2017, http://www.businessinsider.com/sprint-free-unlimited-plan-deal-switch-verizon-att-t-mobile-2017-6.

- Virgin Mobile has announced a year of unlimited service for $1 with the purchase of an iPhone and use of autopay.[32]

- Verizon Wireless has responded to customer losses by introducing its own unlimited data plans.[33]

- Comcast recently introduced a mobile plan for its Xfinity internet customers which charges $45 per line for unlimited data.[34]

- Sprint has priced its baseline unlimited plan at $50 for the first line, well below the three other major carriers.[35]

- T-Mobile recently began offering a free iPhone SE with the purchase of another iPhone, in addition to discounts on iPhone 7 memory.[36]

- AT&T is offering HBO and a $25 per month discount on DIRECTV, U-verse or DIRECTV NOW (DIRECTV's over the top video service) with unlimited data plans.[37]

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32. Natt Garun, "Virgin Mobile goes iPhone-exclusive, offering first year of unlimited service for $1," The Verge, June 21, 2017, https://www.theverge.com/2017/6/21/15847144/virgin-mobile-usa-iphone-exclusive-unlimited-service-deal. See also Virgin Mobile press release, June 21, 2017. https://www.virginmobileusa.com/newsroom/newsdetail2.html

33. See, for example, Mark Huffman, "Verizon introduces unlimited data plan," Consumer Affairs, February 13, 2017, https://www.consumeraffairs.com/news/verizon-introduces-unlimited-data-plan-021317.html.

34. See https://www.xfinity.com/mobile/plan (accessed July 13, 2017), where the $45 price is a limited time offer. Comcast's LTE service will actually be provided over the Verizon network; see Aaron Pressman, "Comcast Offers Wireless Service but Only in Its Region," Fortune, April 6, 2017, http://fortune.com/2017/04/06/comcast-wireless-service/.

35. See Sprint website https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html.

36. See Chris Mills, BGR News, "T-Mobile will give you a free iPhone SE if you buy any iPhone", June 2, 2017, https://www.yahoo.com/tech/t-mobile-free-iphone-se-buy-iphone-201239909.html.

In light of these competing offerings, industry analysts have observed that:

> Wireless carrier competition is accelerating the removal of mobile data constraints just as direct-to-consumer OTT offerings and vMPVDs go mainstream this year… As carriers compete, unlimited plans become the norm, and data prices drop generally.[38]

36. Consistent with the direct evidence of intense competition, metrics of industry pricing show continuous declines over the last several years. For example, the CPI for wireless telephone services has fallen by 25 percent between January 2009 and May 2017.[39] In contrast over this time period, overall inflation has increased by nearly 16 percent,[40] which means that, adjusting for inflation, the wireless price index has declined by 35 percent. Data on wireless industry Average Revenue per Unit ("ARPU") also shows that prices have fallen over time. UBS reports that industry post-paid ARPU has declined from $63.56 to $55.42 between 2013 and 2016, a decrease of 13 percent, while industry total ARPU has declined from $45.58 in 2013 Q1 to $35.93 in 2016 Q4, a decrease of 21 percent.[41]

37. Also consistent with this intense competition is the steady growth in the quality of wireless offerings, as reflected in various performance metrics. For example, North America has among the fastest average mobile data speeds in the world,[42] and those speeds have been

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37. See https://www.att.com/esupport/article.html#!/wireless/KM1182926 (accessed July 14, 2017).

38. Piper Jaffray, "Survey of Mobile Users Points to Sizable Pent-Up Demand With Unlimited Data," March 1, 2017, pp. 1, 5.

39. Based on data from www.bls.gov, Wireless telephone services in U.S. city average, all urban consumers, not seasonally adjusted, series ID CUUR0000SEED03.

40. Based on data from www.bls.gov, All items in U.S. city average, all urban consumers, not seasonally adjusted, series ID CUUR0000SA0.

41. UBS, "Wireless 411: A difficult market asking for repair?" February 22, 2017, Figures 29 and 36.

42. See, for example, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021, Table 3, which ranks North America as the fastest in the world. Although, see also Akamai's State of the Internet Q1 2017 Report, Figure 38, reporting somewhat slower speeds but indicating the United States has faster average wireless speed than any other country in North or South America, and noting substantial speed increases forthcoming with new investments and 5G deployments.

increasing for many years. Between 2013 and 2016, median download speeds for AT&T have more than doubled, increasing from 9.04 Mbps to 18.91 Mbps. Similarly, median download speeds for Verizon Wireless have increased from 8.99 Mbps to 21.11 Mbps. T-Mobile median download speeds have increased from 6.16 Mbps to 21.02 Mbps. Sprint's median download speeds have increased by more than a factor of five, going from 1.92 Mbps in 2013 to 15.04 Mbps in 2016.[43] Similarly CTIA's 2017 Annual Report notes that "Today's 4G LTE mobile data speeds increased nearly 40 times since 3G speeds in 2007, and download speeds for all mobile phones have grown by almost 40 percent since 2015."[44] These improvements in network quality mean that quality adjusted prices have fallen even faster than the data on changes in the wireless prices indicate, as consumers are paying less for a better product.

3. Wireless broadband Internet access providers have the capacity to accommodate new customers.

38. The availability of capacity with which to compete for new customers further heightens competition for wireless broadband Internet access services. Most basically, the fact that carriers are actively pursuing one another's customers, without expressing any concerns about their ability to serve these additional customers, demonstrates the existence of such capacity. And, in fact, Verizon's CFO recently expressed his confidence in their network capability to accommodate additional traffic, including that generated from their new unlimited plans.[45] Barclays has also noted that AT&T can double its capacity between now and 2019 if need be.[46]

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43. United States Speedtest Market Report, Ookla, August 3, 2016, http://www.speedtest.net/reports/united-states/. These results include non-LTE network usage. Federal Communications Commission, Nineteenth Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, DA 16-1061, September 23, 2016 ("19th CMRS Report"), pp. 77-79. Federal Communications Commission, Eighteenth Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, DA 15-1487, December 23, 2015, Table VI.C.2.

44. CTIA 2017 Annual Report, https://www.ctia.org/docs/default-source/default-document-library/ctia-wireless-snapshot.pdf

45. Verizon April 24, 2017 earnings call, CFO Matt Ellis.

46. Barclays, "AT&T Comfortable with Its Options," March 3, 2017, p. 1.

Sprint and T-Mobile have also reported that their wireless networks have ample coverage, and that they continue to increase the capacity of their networks.[47]

4. Customers have the ability to switch between wireless broadband Internet access providers.

39. Finally, effective competition is demonstrated by substantial customer switching among the wireless carriers. Roughly a quarter of wireless customers change wireless providers every year.[48] The sheer number of switches implied by this statistic is enormous: AT&T, Sprint, T-Mobile, Verizon and US Cellular collectively have over 16 million disconnecting customers *every quarter*.[49] Competition for these switching customers is intense, with that competition benefiting all subscribers including those that choose not to switch.

40. As impressive as the actual number of switchers is, average switching levels likely *understate* the competitive pressure created by the ability to switch for multiple reasons.

- First, even if there were a specific time period with less switching, the evidence shows that when the relative quality of the services change, consumers can and do switch. As

47. See Sprint 10-K for Year ending March 31, 2017, p. 26 ("We continue to increase coverage and capacity by densifying and optimizing our existing network… The 2.5 GHz spectrum band carries the highest percentage of Sprint's LTE data traffic. We have significant additional capacity to grow the use of our 2.5 GHz spectrum holdings into the future. Sprint believes it is well-positioned with spectrum holdings of more than 160 MHz of 2.5 GHz spectrum in the top 100 markets in the U.S."). See also T-Mobile 10-K for Year ending December 31, 2016, p. 6 ("We continue to increase the depth, breadth and functionality of the nation's densest LTE network by adding new spectrum to increase coverage, and re-farming existing spectrum and implementing new technology to augment capacity… We owned or had agreements to own an average of 86 MHz of spectrum across the top 25 markets in the U.S. as of December 31, 2016, comprised of an average of 12 MHz in the 700 MHz band, 30 MHz in the 1900 MHz PCS band and 44 MHz in the AWS band. This is compared to an average of 85 MHz of spectrum across the top 25 markets in the U.S. as of December 31, 2015.").

48. 19th CMRS Report, ¶ 18. See also wireless churn rates of 1.61% in 4Q 2016, per UBS Securities LLC, "Wireless 411: A difficult market asking for repair," February 22, 2017, Figure 35.

49. UBS, "Wireless 411: A difficult market asking for repair?" February 22, 2017, Figure 35.

noted above, when T-Mobile and Sprint had unlimited data plans available and Verizon did not, Verizon began losing many customers until Verizon responded by introducing unlimited data plans of its own.

- Second, the ability to switch drives competition, and that very competition may result in customers not actually switching. That is, promotions are sponsored to encourage switching, but other carriers immediately respond to convince their customers to stay. The customers thus obtain the benefits of being able to switch without having to actually do so. Investment analysts have noted both the ease of switching and how promotions force immediate responses.[50]

41. Notably, even if historically there was a question about the extent of consumers' ability to switch wireless providers,[51] the ease of switching is clear today:

- Long term contracts are increasingly unimportant as potential barriers to switching in this industry. Most notably, there has been an industry trend away from long-term contracts, and AT&T, T-Mobile, and Verizon do not currently offer *any* plans with two-year contracts.[52] The dwindling number of contract customers of these carriers will soon cycle off their contracts. Those customers who still have long-term contracts are not prevented from switching: they simply have to pay early termination fees to do so, and, as noted above, carriers often offer to pay for any such fees.

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50. See, for example, Frost & Sullivan, "Analysis of Unlimited Data Plans, May 17, 2017, p. 1, and Pacific Crest Securities, "Unlimited Data Buffet," March 6, 2017, pp. 1-3.

51. In the past, the Commission's Mobile Wireless Competition reports (CMRS reports) have suggested that contract length, handset exclusivity and lack of interoperability presented some potentially significant barriers to switching. See, *e.g.*, 19th CMRS Report, note 375.

52. Comments of CTIA, WT Docket No. 16-137, May 31, 2016, at 47; Mike Dano, "Sprint resurrects two-year wireless service contracts to give customers more choices," February 26, 2016, http://www.fiercewireless.com/wireless/sprint-resurrects-two-year-wireless-service-contracts-to-give-customers-more-choices

- Carriers allow handset portability, so customers can take their handsets with them when they change carriers, further facilitating customer switching.[53] The convergence of networks to LTE means that any technological barriers to handset portability are also decreasing as well. And there are no exclusive handset arrangements that would materially impact customers' ability to switch.

- The large volume of advertising by carriers, described above, along with the prevalence of carrier comparisons available not only from the carriers themselves but from many different consumer review sites and publications together suggest that search costs are quite low today.[54]

42. As discussed above, carriers aggressively target one another's customers and work hard to make switching as easy as possible. As part of this, carriers offer a variety of incentives specifically to make it easier and more attractive for customers to switch, such as paying for any early termination fees and offering substantial credits for switching.[55] For example, Sprint is

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53. In order to port their handset to another carrier, customers who purchased their handset on an installment plan must complete payments for the handset under that plan. See, for example, T-Mobile, "Bring your own phone and get nationwide LTE coverage with ZERO commitment," https://www.t-mobile.com/bring-your-own-phone.html. An American Consumer Satisfaction Index survey reports that "moving between carriers has never been easier." ACSI Telecommunications Report 2016, at 9, https://consumermediallc.files.wordpress.com/2016/05/acsi_2016_telecom_report.pdf.

54. See, for example, Consumer Reports, "Cell Phone & Service Buying Guide," June 2017, http://www.consumerreports.org/cro/cell-phones-services/buying-guide.htm; Tom's Guide – The Best and Worst Phone Carriers, June 13, 2017, https://www.tomsguide.com/us/best-phone-carriers,review-3066.html; J.D. Power, "Wireless Network Data Speeds Improve but Not Incidence of Data Problems," March 2, 2017, http://www.jdpower.com/press-releases/jd-power-2017-us-wireless-network-quality-performance-study.

55. See, for example, AT&T, "Get up to $650 in credits per line to help you switch to AT&T," https://www.att.com/shop/wireless/switch-and-save-etf.html. Chris Moran, "T-Mobile to Dangle 'Risk-Free' 14-Day Trial for Verizon Customers," Consumerist, May 5, 2015. Verizon, "Switch to Verizon and Get Up to $650," https://www.verizonwireless.com/promos/switch-and-save/?dtb=1&requestid=423260. T-Mobile, "There's never been a better time to switch to T-Mobile," offering credit of up to $650, https://www.t-mobile.com/offer/switch-carriers-no-early-termination-fee.html?irgwc=1&clickid=Wd2TNA0mVVQ1S9YS0CVIoQ2VUkhyIIRK3XseWA0&ir

offering a year of unlimited data for mobile customers that switch.[56] The prevalence of these offers indicates that carriers expect that many consumers are willing and able to switch; as a matter of economics, they would otherwise have no incentive to devote time and effort to promotions designed to encourage switching.

43. To be clear, fierce competition does not require all customers to regularly change providers, or even necessarily a large portion of them. Rather, as long as a reasonable portion of customers have the ability to change providers, that is an indication that there are a significant number of "marginal customers," with competition for these customers driving effective competition. The ability to switch readily can be present even with modest churn rates.

44. Finally, we note that reports cited in the Title II Order as evidence of switching costs do not actually demonstrate anything of the sort.

- The Title II Order cited to a Bernstein Research report noting that some subscribers do not switch carriers despite the presence of lower priced plans on other carriers.[57] But this does *not* show that there are high switching costs. Because wireless services are differentiated on multiple dimensions, including quality, one should not expect all (or even most) customers to switch to the lowest price plan. Verizon Wireless, for example, touts the quality of its network and prices its services at a premium relative to its competitors. The fact that many consumers choose Verizon over Sprint does not imply there are switching costs preventing Verizon customers from moving to Sprint, but rather is consistent with the fact some customers are willing to pay higher prices for what they perceive as higher quality service. For example, the existence of a price difference between premium ice cream and store-brand ice cream does not mean that there are large

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adid=187834&ircid=3290&irpid=123412&cmpid=WTR_AF_Digital%20Trends.&sharedid. David Curry, "Sprint Extends 50 Perfect Mobile Promotion for T-Mobile, AT&T and Verizon Customers," Digital Trends, January 7, 2016.

56. Jeff Dunn, "Sprint is offering an aggressive deal," Business Insider, June 13, 2017, http://www.businessinsider.com/sprint-free-unlimited-plan-deal-switch-verizon-att-t-mobile-2017-6.

57. Title II Order, note 214.

switching costs, nor does it mean a lack of competition between the products. Rather, these are differentiated products and some consumers are willing to pay extra for perceived higher quality.

- The Title II Order also cited a Consumer Reports study for the proposition that switching costs are particularly high in the wireless industry. But that claim is inconsistent not only with the facts of the industry (as discussed above), but also *with other Consumer Reports studies*.[58] Although the cited 2014 article refers to a study by Consumer Reports that "most respondents stayed with their provider more than two years, the length of a standard contract, even though only half were highly satisfied,"[59] even at that time Consumer Reports noted that "the landscape [was] changing [and] [t]he two-year contract [was] under assault."[60] Another Consumer Reports article went on to explain that no-contract services were becoming more common even at that time and were available from larger wireless providers such as AT&T, Sprint and Verizon as well as smaller wireless providers, and that T-Mobile had discontinued contracts altogether.[61] And still another contemporaneous Consumer Reports article was devoted to explaining that consumers *did* in fact have exit options even at that time. In particular, that article noted that consumers can always quit within 14 days of signing up for service without penalty, that past that period early termination fees are prorated, and that consumers can sell their subsidized phones to recoup the cost of the handset and pay off an early termination fee.[62] A subsequent Consumer Reports survey found that 71% of consumers would switch to a different Internet service provider if their current ISP started to block or impose extra charges to use high-bandwidth services.[63] And switching costs are even

58. Title II Order, note 134.

59. Consumer Reports, "The complete Smart-phone shopping guide," January 2014.

60. Consumer Reports, "Switch when you think you can't," January 2014.

61. Consumer Reports, "The complete Smart-phone shopping guide," January 2014.

62. Consumer Reports, "Switch when you think you can't," January 2014.

63. Consumer Reports, "71% of U.S. households would switch from providers that attempt to interfere with Internet," February 18, 2014.

lower today, given the continued decline of long-term contracts and the rise of handset portability.

C. There is significant competition for fixed broadband Internet access services.

45. In this section, we turn to the evidence of effective competition for fixed broadband Internet access services, following the same outline as our discussion of competition for the wireless case.

1. Consumers have choices among fixed broadband Internet access providers.

46. According to the Commission's Internet Access Services report, as of June 2016, 97% of developed census blocks had at least two providers offering fixed 10 Mbps or greater Internet service, and 79% of the blocks had at least three providers.[64] As discussed in more detail below, having two wireline competitors likely is enough to create fierce rivalry, particularly given the large sunk costs of networks and customer acquisition. Indeed the Commission itself has acknowledged that two competitors can create effective competition in industries with large sunk costs. It did so most recently in its order on Business Data Services, where it found that the presence of a second competitor is sufficient to place an effective competitive constraint on business data services pricing and supply, and that the largest competitive benefit comes from the second competitor.[65] And in the video context, the Commission has long recognized that a second competitor can provide effective competition with the incumbent cable provider.[66]

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64. Federal Communications Commission, "Internet Access Services: Status as of June 30, 2016," April 2017, Figure 4.

65. Federal Communications Commission, Report and Order in the Matter of Business Data Services in an Internet Protocol Environment, FCC 17-43, April 28, 2017, ¶¶ 15, 53 and 120.

66. The Commission has for many years used a statutory definition of "effective competition" with respect to cable video providers. Congress passed an Act in 1992 indicating a "preference for competition," under which franchising authorities can only regulate basic cable rates and equipment if the cable system is not subject to "effective competition." That can be shown in a number of ways, but the most relevant here are

2. There is intense rivalry between fixed broadband Internet access providers.

47. There is also intense rivalry between telcos, cable companies and other entrants with respect to fixed Internet services. Indicators of this rivalry include, among others:

- Steady improvements in quality: Average speeds have increased steadily, tripling between 2011 and 2014. The 2016 Fixed Broadband Report finds over the course of its surveys that there have been average annual speed increases of 21 percent for DSL and 47 percent for cable.[67]

- Advertising expenditures: Fixed broadband Internet access providers spend heavily on advertising.[68] Through this advertising, providers fight to differentiate themselves from their competitors by touting the speeds they are able to offer as well as their customer satisfaction ratings.[69] As a matter of economics, it would not be rational to spend this

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that effective competition is present if there are at least two providers each covering at least half the households in the area, and the smaller of the two has at least a 15 percent share; or, alternatively, if any local exchange carrier offers video service. Federal Communications Commission, Report and Order in the Matter of Amendment to the Commission's Rules Concerning Effective Competition, 30 FCC Rcd. 6574, June 3, 2015, ¶ 2

67. See, for example, Federal Communications Commission, 2015 Measuring Broadband America Fixed Broadband Report, December 30, 2015, noting that actual average download speeds tripled between 2011 and 2014. See also 2016 Report, p. 31, noting "annual average increase in download speeds by technology has been 47% for cable, 14% for fiber, 21% for DSL…"

68. For example, Ad Age reports that AT&T, Comcast and Verizon are among the top five highest spenders on advertising in the United States. We note that these data do not provide information about advertising expenditures by type of service. http://adage.com/article/advertising/top-200-u-s-advertisers-spend-smarter/304625/.

69. See for example Jon Brodkin, "Not so fast—Comcast told to stop claiming it has 'fastest Internet,'" ArsTechnica, February 8, 2017. See also Verizon FiOS advertisement claiming "Fios is not cable. We're wired differently," and "Fios is more likely than Comcast, Spectrum, Optimum, and Cox to be recommended by customers to friends and family," https://www.verizon.com/home/fios/#fios_expert/.

much on advertisements focused on differentiating offerings from competitors if there were not strong competition among providers for consumers.

3. Fixed broadband Internet access providers have the capacity to accommodate new customers.

48. There are no concerns about capacity constraints with respect to the ability to accommodate new customers. Existing vendors can and do accommodate new customers in the areas where they offer service.[70] And, like with wireless competition, the fact that providers actively compete to steal customers from one another demonstrates that they have available capacity with which to serve those customers.

4. Customers have the ability to switch between fixed broadband Internet access providers.

49. The ability to switch fixed access providers is demonstrated by the fact that churn is an important strategic focus in the broadband Internet access industry.[71] The focus on reducing churn is evident in providers' focus on "save desk" efforts. Customers thinking about leaving their Internet service provider must call to disconnect service, and they are then referred to save desks that will offer substantial discounts or other inducements to persuade the customer to stay.[72] This is competition in action; the ability to switch leads firms to offer substantial inducements to stay, thus benefiting even those customers who ultimately choose not to switch.

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70. See, for example, Federal Communications Commission, 2016 Broadband Progress Report, January 29, 2016.

71. See, for example, discussions from AT&T and Comcast. https://seekingalpha.com/article/4065304-t-t-q1-2017-results-earnings-call-transcript?part=single and http://www.nasdaq.com/article/comcast-earnings-growth-in-nbcuniversal-high-speed-internet-and-cable-tv-continues-to-boost-revenues-cm739677

72. This is widely recognized in the industry and by consumer groups. See, for example, Nova Safo, "Want to save money? Call your cable company." Marketplace, October 9, 2014, https://www.marketplace.org/2014/10/09/business/want-save-money-call-your-cable-company ("'It costs companies five times as much to acquire a new customer than it does to keep an old one.' So, it is a factored-in cost of doing business to provide

50. The fact that consumers have – and can make use of – a credible threat to switch fixed broadband Internet access providers is well-recognized in the industry. For example, Consumer Reports has for years advocated for consumers to simply ask for discounts for Internet service.[73] The implied threat, of course, is that if they do not get a better deal they will take their business elsewhere, and the credibility of a threatened switch is demonstrated by the success of such requests. A survey by Consumer Reports in 2012 found that roughly a third of consumers surveyed had, in fact, asked for discounts and 90 percent of them had obtained discounts or upgrades as a result.[74]

51. Notably, this threat to switch also serves to discipline Internet provider behavior. As noted above, surveys indicate that consumers would switch if they felt their broadband provider started to block, slow down, or impose other restrictions on the content they demanded.[75] Again, this is competition in action, anti-consumer actions by Internet providers would lead to substantial costs in the form of consumer departures.

52. Finally, as with wireless, search costs are very low in this industry, as there is no shortage of comparative advertising, including direct mailing and circulars.

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discounts or other incentives for customers who call and ask."). See also Nicholas Maechler, Kevin Neher & Robert Park, "From touchpoints to journeys: seeing the world as customers do," McKinsey & Company, March 2016, http://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/from-touchpoints-to-journeys-seeing-the-world-as-customers-do ("In economic terms, a retained customer delivered significantly greater profitability than a newly acquired customer over two years. Churn, due to pricing, technology, and programming options, was an increasingly familiar problem in this hypercompetitive market. So was retention. The common methods for keeping customers were also well known but expensive—tactics like upgrade offers and discounted rate plans, or 'save desks' to intercept defectors.").

73. See, for example, Consumer Reports Telecom Service Buying Guide, http://www.consumerreports.org/cro/telecom-services/buying-guide.htm.

74. Consumer reports, "Haggling for a lower telecom bill really works," May 17, 2012, http://www.consumerreports.org/cro/news/2012/05/haggling-for-a-lower-telecom-bill-really-works-says-one-cr-editor/index.htm.

75. Consumer Reports, "71% of U.S. households would switch from providers that attempt to interfere with Internet," February 18, 2014, http://www.consumerreports.org/cro/news/2014/02/71-percent-of-households-would-switch-if-provider-interferes-with-internet-traffic/index.htm.

D. Two competitors can lead to intense competition.

53. Some commentators may suggest that areas with two wireline broadband providers are not effectively competitive and thus should be subject to common carrier regulation. Such suggestions are inconsistent with the economics of this industry and, accordingly, with the historical regulatory treatment of industries such as cable. Economics teaches that in markets such as broadband Internet access, the presence of two competitors is likely to result in effective competition.[76] In particular, the presence of high sunk costs in this industry means that competition is likely to be intense, even with only two providers. As one of us has previously explained in the Business Data Services proceeding:

> [T]he characteristics of the BDS marketplace imply that, where an ILEC faces at least one competitor, competition is likely to be intense. An investment in BDS network facilities effectively represents a durable commitment by the provider to specific geographic locations. This follows because such investments are in large part economically "sunk," which means that the relevant variable costs exclude those sunk costs, giving all providers in the area low variable costs to serve new business and thus strong economic incentives to serve any available business in the area. These sunk investments thus thrust rivals into vigorous price competition. Stated differently, when there are two BDS providers, both rivals have every incentive to maximize the return on their network investments.[77]

54. This logic, that sunk investment tends to create intense competition, applies to the broadband industry, and this general proposition is well known in the economic literature. For example, as noted by Richard Gilbert, "sunk costs are likely to contribute to exit barriers,"[78] and

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76. The fact that competition can be intense even with a small number of competitors is well known in economics. For example, Professors Joseph Farrell and Carl Shapiro have noted that "high concentration can be compatible with vigorous competition and efficient market performance." Joseph Farrell & Carl Shapiro, "Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition," UC Berkeley Competition Policy Center, Working Paper, November 25, 2008, at 4.

77. See, Mark Israel, Daniel Rubinfeld, and Glenn Woroch, "Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM And a Proposed Competitive Market Test," Competitive Analysis of the FCC's Special Access Data Collection," August 9, 2016, submitted in WC Docket No. 05-25, p. 2.

78. Richard Gilbert, "Mobility Barriers and the Value of Incumbency," in Handbook of Industrial Organization, Vol. 1, Richard Schmalensee and Robert Willig, editors, (1989), p. 520.

where such exit barriers exist, firms have strong incentives to stay and compete even as prices fall because they do not wish to walk away from the large, unrecoverable investments they have already made. Put another way, once the sunk network is in place, even a small return is better than no return. This economic logic is consistent with the save desk behavior discussed above: Due to large, sunk customer acquisition costs, firms are willing to compete aggressively to prevent customers from switching, including via substantial save desk promotions.

55. Indeed, the Commission has previously found that in the presence of large sunk costs with respect to business data services, most of the benefits of additional competition appear with the introduction of a second provider. As the Commission explained:

> [T]here is a substantial competitive effect when a wireline competitor is present to discipline rates, terms, and conditions to just and reasonable levels. … [T]here is a general expectation that the largest benefits from competition come from a second provider, with added benefits of additional providers falling thereafter, in part because, consistent with other industries with large sunk costs, the impact of a second provider is likely to be particularly profound in the case of wireline network providers. A wireline provider is willing to cut prices to as low as the incremental cost of supplying a new customer, requiring minimal contribution to its sunk costs.[79]

E. Rapid wireless-wireline convergence is further intensifying competition.

56. Convergence between wireless and wireline services is further increasing the number of options available to customers (who might previously have looked only at wireless or only at wireline options), and thus further increasing the intensity of competition.

57. The fact that convergence is occurring is beyond reasonable controversy. For example, whereas there was once debate about whether wireless voice services would ever compete directly with landline voice service, they now not only compete with landline voice services,

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79. Federal Communications Commission, Report and Order in the Matter of Business Data Services in an Internet Protocol Environment, FCC 17-43, April 28, 2017, ¶120 ("In addition, we find that the presence of a nearby competitor is likely to prevent substantial abuse of market power, whether through high prices or lack of innovation, and equally that a lack of actual supply by a nearby competitor likely arises when existing suppliers' offerings are reasonable in both price and service characteristics."). See also ¶¶ 15, 53.

they have become the dominant form of voice connectivity. As of December 2016, the Centers for Disease Control ("CDC") reports that more than half of U.S. households have *only* wireless voice connections at home (50.8%), and that another 16.7% have a landline at home but conduct essentially all of their calls on wireless. That is, two thirds of households essentially do not use landlines anymore for voice traffic, more than double the fraction from 2008.[80] Wireless voice service does not just compete with wireline voice service, but has largely supplanted it. This is perhaps not surprising given that a wireless connection can be used both at home and elsewhere – it is mobile – and it does not require installation in the same way. It is also portable with the consumer when they move residences.

58. The same process of convergence is occurring with respect to data services. Already, the Pew Research Center estimates that about 12% of households in 2016 obtained Internet service at home solely through their smart phones.[81] One reason wireless data service is growing in usage is that the quality of mobile broadband service has improved and now has speed metrics comparable to commonly used wireline services.[82] Moreover, when comparing wireless and wireline speeds, it is important to note that while a wireline connection may be shared between multiple users, wireless connections are typically measured on a per device basis, so two smart phone users in a household may each be taking advantage of 25 Mbps connections on their phones, while a landline connection in the home may be 25 Mbps and be shared between the two.

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80. The CDC began tracking wireless mostly households in 2008. See CDC NHIS wireless reports. https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201705.pdf. https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201106_tables.htm.

81. The fractions are higher for younger generations. The Pew Research Center estimates that 17% of 18-29 year olds obtained Internet access at home strictly through their smart phones (i.e., did not use a landline broadband connection at home at all). Even among 65+ year olds, 7% did so. http://www.pewinternet.org/fact-sheet/internet-broadband/ http://www.pewinternet.org/fact-sheet/mobile/

82. Compare, for example, Tom's Guide, "The Fastest Wireless Network of 2017," March 28, 2017, reporting speed test results of 36.0 Mbps for Verizon, 23.5 Mbps for T-Mobile, 25.6 Mbps for AT&T and 17.7 Mbps for Sprint, with Federal Communications Commission, "2016 Measuring Broadband America Fixed Broadband Report," Chart 3, showing median speed of 32 Mbps in 2014 and 41 Mbps in 2015.

59. Wireless is catching up with wireline in other respects as well. The Commission has previously noted, for example, that mobile broadband service may have data allowances more restrictive than on wireline connections.[83] However, as discussed above, wireless plans offering unlimited data are widely available today. Wireless is also widely used for streaming video, just as wireline is. Roughly half of all data traffic on wireless networks today is streaming video, and that fraction is expected to rapidly increase.[84] Indeed, usage of wireless data itself has exploded, increasing over 3,400 percent between 2010 and 2016.[85] As Cisco has noted "[t]his situation is encouraging mobile broadband substitution for fixed broadband."[86] Again, this increased competition decreases any potential need for regulation.

60. Industry analyst Piper Jaffray has noted how the increasing usage of unlimited data plans coincides with the increase in over the top ("OTT") video options. "The removal of data constraints could not come at a better time, in our view, with rapidly evolving OTT offerings. We found that with an update to unlimited data, 35% of consumers expect to increase their long-form video consumption … We expect this pace of growth to continue as carriers remove data constraints and subscribers utilize new OTT and premium streaming music services in a truly 'entertainment everywhere' environment."[87]

61. LTE technologies are also continuing to advance in ways that are making mobile data services better substitutes for wireline services. For example, Sprint has launched "Gigabit Class

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83. Federal Communications Commission, 2016 Broadband Progress Report, FCC 16-6, January 29, 2016, ¶ 41 ("Consumers that are dependent solely on mobile broadband are significantly more likely to exceed their monthly data allowances, causing them to incur additional fees or forego use of the Internet. And, as several commenters note, mobile broadband networks lack the capacity or consistency of service to support most bandwidth intensive uses such as full-screen HD video streaming, online gaming, and video conferencing applications including telehealth and education platforms.").

84. See, for example, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020.

85. CTIA Annual Survey.

86. Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020.

87. Piper Jaffray, "Survey of Mobile Users Points to Sizable Pent-Up Demand With Unlimited Data," March 1, 2017, pp. 1, 5.

LTE" in New Orleans, and T-Mobile claims to have achieved near-gigabit speeds on its LTE network.[88] Indeed, T-Mobile has indicated plans to retire its 2G and 3G networks entirely in favor of LTE.[89] All of the carriers have continued to invest in both expanding and upgrading their LTE networks, with notable improvements in speed as a result.[90] It is already the case that consumers in various cities can obtain wireless data speeds of 50, 60, 70, 80 Mbps or more.[91]

62. Fixed wireless services in particular are targeted at landline replacement. AT&T lab trials for fixed wireless have achieved speeds up to 14 Gbps.[92] Other firms have reported field trials with even higher speeds, including 15.4 and 25.2 Gbps in France, 24.7 Gbps in Turkey, and 35 Gbps in Singapore.[93] Press accounts report that Google, following its acquisition of fixed wireless provider Webpass, has begun offering fixed wireless broadband with speeds of up to 1 Gbps to residential consumers in six cities and is transitioning its Google Fiber initiative to focus on fixed wireless.[94]

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88. Akamai's State of the Internet Q1 2017 Report, p. 45, https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf.

89. Akamai's State of the Internet Q1 2017 Report, p. 45, https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf.

90. See, for example, Open Signal, State of Mobile Networks: USA (February 2017), https://opensignal.com/reports/2017/02/usa/state-of-the-mobile-network.

91. Tom's Guide, "The Fastest Wireless Network of 2017," March 28, 2017.

92. AT&T press release, "AT&T details 5G evolution," January 4, 2017, http://about.att.com/story/att_details_5g_evolution.html.

93. Akamai's State of the Internet Q1 2017 Report, p. 45, https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf.

94. Bernie Arnason, "Google Fiber Now Pushing Gigabit Fixed Wireless," telecompetitor, January 31, 2017, http://www.telecompetitor.com/google-fiber-now-pushing-gigabit-fixed-wireless/.

63. These trends will only accelerate as 5G wireless services are deployed over the coming years.[95] For example, AT&T's projects in this area through 2017 include lab and field trials of both mobile and fixed 5G.[96] Ericsson, a major network equipment vendor, has estimated that by 2022, a quarter of US mobile subscriptions will be on 5G networks.[97] The development of 5G will further increase the competitiveness of wireless broadband Internet access services:

- Ericsson states that its 5G equipment will provide "ultra-high reliability" along with "very high data rates" and "very low latency."[98] The 5G specification calls for 20 Gbps downloads and an ability to support 1 million devices per square kilometer.[99]

- 5G is expected to make fixed wireless an even more robust competitor to wireline. For example, according to news site Telecompetitor, "[t]he advent of 5G, and specifically pre-5G, will enable larger tier one carriers like Verizon and AT&T to enter the gigabit fixed wireless space as well."[100]

- Industry observers recognize that 5G will accelerate the trend toward wireless-wireline convergence, stating that the "most obvious application of 5G is as a replacement for

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95. See, for example, Comments of CTIA, WT Docket No. 17-69, May 8, 2017, at 47-54; and Comments of Verizon, WT Docket No. 17-69, May 8, 2017.

96. AT&T press release, "AT&T details 5G evolution," January 4, 2017, http://about.att.com/story/att_details_5g_evolution.html.

97. Ericsson Mobility Report, November 2016, https://www.ericsson.com/assets/local/mobility-report/documents/2016/ericsson-mobility-report-november-2016.pdf.

98. Ericsson White Paper, "5G Radio Access," April 2016, p. 1, https://www.ericsson.com/assets/local/publications/white-papers/wp-5g.pdf.

99. Akamai's State of the Internet Q1 2017 Report, p. 45, https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf.

100. Bernie Arnason, "Google Fiber Now Pushing Gigabit Fixed Wireless," telecompetitor, January 31, 2017, http://www.telecompetitor.com/google-fiber-now-pushing-gigabit-fixed-wireless/.

traditional home Internet service. And it's coming really soon, with Verizon and AT&T already investing in trials in the US."[101]

64. The evidence presented above makes clear that wireless-wireline convergence is occurring today. And that process will only accelerate as 5G networks are deployed. That is important because regulatory regimes should be forward-looking in the sense that they should depend, at least in part, on expected technological and market developments, such as the expected future state of competition.[102] For example, the OECD Guiding Principles for Regulatory Quality and Performance states that, in the face of continual and far-reaching social, economic, and technological changes, governments should "ensure that their regulatory structures and processes are relevant and robust, transparent, accountable *and forward-looking*."[103] To implement regulation based on the state of convergence today, even as that convergence accelerates every year, would be to ensure that the regulation would quickly be outdated and need to change to keep up, increasing the costs associated with regulatory burdens and uncertainty, described in the next section.

F. "Terminating access monopoly" concerns do not apply to broadband ISPs.

65. The Title II Order asserted that broadband providers enjoy a "terminating access monopoly" that provides "the ability to act as gatekeepers even in the absence of 'the sort of market concentration that would enable them to impose substantial price increases on end users.'"[104] That is incorrect, as the Order misapplies the concept of terminating access

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101. Roger Cheng, "Not just speed: 7 incredible things you can do with 5G," Cnet, March 2, 2017, https://www.cnet.com/news/5g-not-just-speed-fifth-generation-wireless-tech-lets-you-do-vr-self-driving-cars-drones-remote/.

102. To be clear, this is a different discussion than the treatment of costs in price regulation. For a discussion of forward-looking cost, see, for example, William Rogerson, "On the Relationship Between Historic Cost, Forward Looking Cost and Long Run Marginal Cost," 10 Review of Network Economics (2011).

103. Organisation for Economic Co-operation and Development, OECD Guiding Principles for Regulatory Quality and Performance, 2005, at 1 (emphasis added).

104. Title II Order, ¶ 84.

monopoly. In fact, the preconditions for terminating access monopoly do not exist at all in the present context.

66. As a general matter, "terminating access" problems are not market failures to be ameliorated by regulatory intervention, but are actually market distortions *created by* regulation, most notably in the context of landline voice long-distance services.[105] In that context, interexchange carriers ("IXCs") required access to local exchange carrier ("LEC") networks to terminate calls. LECs could charge high fees for that access and the IXCs were required to pay those fees. The IXCs could not charge their own customers different fees based on the LEC fees, and the LEC customers had no direct relationship with the IXCs. Because the end users did not have to bear the higher costs, they had no reason to switch to an alternative terminating access provider, which arguably gave their local provider market power in the provision of terminating access service.

67. In contrast, if an Internet Service Provider attempted to block or throttle specific content, its end user customers would be directly affected by, and could directly observe, that behavior, and they would have the incentive and ability to react to that conduct. The same is true if an Internet Service Provider attempted to impose discriminatory charges on particular content providers: Unlike long distance carriers, those content providers would be under no regulatory obligation to agree to those fees, nor would they be prevented from passing them on to the customers of the Internet Service Provider that imposed them. That is, because end consumers can directly observe and respond to any blocking, throttling or cost differentials, the problem created by regulation with respect to long distance service does not exist here, and the Title II Order is incorrect in suggesting otherwise.

68. Not only are there no regulatory distortions to create terminating access monopoly concerns in broadband Internet access, but industry participants do not appear to behave as though broadband providers or firms in analogous situations have terminating access

105. Andres Lerner & Janusz Ordover, "The 'Terminating Access Monopoly' Theory and the Provision of Broadband Internet Access," January 14, 2015. Jonathan Nuechterlein & Christopher Yoo, "A Market-Oriented Analysis of the 'Terminating Access Monopoly' Concept," 14 Colo. Tech. L.J. (2015).

monopolies. For example, MVPDs do not charge content providers for access to their customers, but rather pay content providers to provide content to the MVPDs' customers. Similarly, broadband Internet service providers frequently pay backbone providers for transit, effectively paying to enable their own customers' access to content.

69. Moreover, all major broadband service providers have direct and indirect interconnection arrangements with many other firms, including content delivery networks, Internet backbones, and peers. Thus, even apart from other market-based checks on anticompetitive conduct, the variety of paths into any broadband provider's network, combined with the ready availability of transit as an alternative to direct interconnection, keep any broadband provider from exercising monopoly power over access to its customers.[106]

70. Finally, to the extent there were any legitimate concerns about broadband providers having a "terminating access monopoly," those concerns would be fully addressed by prohibitions on unjustified blocking and throttling, coupled with transparency requirements. And the availability of antitrust laws would provide a further backstop to address any anticompetitive discrimination in the provision of broadband Internet access.

G. "Externalities" do not justify Title II regulation.

71. The Title II Order suggested that "externalities" justify common carrier regulation even in the presence of broadband competition.[107] We disagree. Given the well-known costs of

106. See, for example, Stanley M. Besen & Mark A. Israel, "The Evolution of Internet Interconnection from Hierarchy to 'Mesh': Implications for Government Regulation," 25 Info. Econ. & Pol'y 235 (2013).

107. See, for example, Title II Order, ¶ 83 ("In addition to the [antitrust related] harms outlined above, broadband providers' behavior has the potential to cause a variety of other negative externalities that hurt the open nature of the Internet. Broadband providers have incentives to engage in practices that will provide them short term gains but will not adequately take into account the effects on the virtuous cycle. In the [2010 Order], the Commission found that the unaccounted-for harms to innovation are negative externalities, and are likely to be particularly large because of the rapid pace of Internet innovation, and wide-ranging because of the role of the Internet as a general purpose technology. Further, the Commission noted that a broadband provider may hesitate to

regulation, particularly in fast moving industries, any externality-based concern here would have to be clear, significant, and unable to be addressed through more targeted regulation in order to justify *additional* common carrier regulation. None of those elements are present here.

72. As we discuss in more detail below, the Title II Order's analysis has not considered important harms from regulation, which include negative externalities created by the regulation itself. In particular, the Title II Order's policy prescriptions benefit some groups but harm others, and the Title II Order has neither considered those tradeoffs nor the general concerns about regulatory cross-subsidization.[108] For example:

- As discussed below, regulation of network management practices will tend to deter practices that would otherwise help relieve congestion, resulting in a lower quality service for affected subscribers.

- Policies that favor some edge content providers can disfavor others.[109] In the presence of congestion, for example, treating all traffic identically can harm edge content providers that benefit most from faster delivery. As such, while the Title II Order expresses concerns about externalities created by some broadband provider behaviors that might negatively affect some edge content providers, it fails to recognize that its own preferred "nondiscrimination" policies also negatively affect certain edge providers but not others.

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impose costs on its own subscribers, but it will typically not take into account the effect that reduced edge provider investment and innovation has on the attractiveness of the Internet to end users that rely on other broadband providers—and will therefore ignore a significant fraction of the cost of forgone innovation."). See also 2010 Order, ¶ 25.

108. For a more detailed discussion of these effects, see, for example, Michael Katz, "Wither U.S. Net Neutrality Regulation?" 50 Review of Industrial Organization (2017); Keith Hylton, "Law, Social Welfare, and Net Neutrality," 50 Review of Industrial Organization (2017); Joseph Farrell, "Some Simple Analytics of Vertically Linked Markets," 50 Review of Industrial Organization (2017); and Michelle Connolly, Clement Lee & Renhao Tan, "The Digital Divide and Other Economic Considerations for Network Neutrality," 50 Review of Industrial Organization (2017).

109. See, for example, Christopher Yoo, "Avoiding the Pitfalls of Net Uniformity: Zero Rating and Nondiscrimination," 50 Review of Industrial Organization (2017).

73. Putting aside the fact that common carrier regulation itself favors some users at the expense of others, we also note that the externality concerns in the Title II Order are overblown. Contrary to the assumptions embedded in the Title II Order, large Internet platforms do internalize a great number of factors. For example, Profs. Leibowitz and Margolis have explained that it "might reasonably be expected that an owned or sponsored network would not be subject to market failure. After all, a network owner would be motivated to make investments or provide incentives to increase the net value of the network by internalizing any network effects."[110] Furthermore, concerns of this type are generally premised on parties not interacting with one another (*e.g.*, a polluter does not interact directly with people affected by their pollution). However, with respect to edge content providers, that is not the case. Unlike a polluter that can save money while not bearing the costs of its actions, harming edge content providers directly impacts the demand for broadband services, both from the consumer side and the edge content provider side. Those content providers interact directly with both the network provider and with end consumers. The presence of such interactions can allow the parties to internalize effects. In this situation, "the existence of an externality is unlikely."[111]

74. In sum, when discussing "externalities," the Title II Order appears to be based on a premise that broadband service providers do not understand the value of a healthy edge content provider industry to their business. This is not a reasonable premise. Network providers have invested enormous amounts of money building out their infrastructure and continue to do so, and as a result they have strong incentives to be certain there is plenty of content to drive demand for that infrastructure. Edge providers generate that demand.

75. In supporting its claim of an externality problem, the Title II Order presented only a handful of examples of conduct supposedly demonstrating "externality" problems, which we refute in the next section. Aside from these, the Title II Order raised the possibility of paid

110. S. Leibowitz & S. Margolis, "Network Externality: An Uncommon Tragedy," 8 Journal of Economic Perspectives 2 (1994), at 141.

111. S. Leibowitz & S. Margolis, "Network Externality: An Uncommon Tragedy," 8 Journal of Economic Perspectives 2 (1994), at 144.

prioritization or differential charges for access as raising the specter of "externality" concerns.[112] This appears to be a "solution" in search of a problem given the lack of industry efforts to engage in paid prioritization. In fact, as a matter of economics paid prioritization could well increase consumer welfare.[113] In any event, there is no economic justification here for a categorical ban on all paid prioritization arrangements regardless of their specific features.

76. Finally, as with the terminating access monopoly concerns, even if one maintains some concern about externality issues, Title II regulation is not the right solution to such concerns. In particular, no identified "externality" problem requires a solution beyond prior no-blocking and no-throttling and transparency rules. As a general matter, unless there is a clearly demonstrated and substantial problem, clear evidence that regulation can address that problem, and confidence that the regulation will not create greater problems than it solves, our conclusion as economists is that the market should be left to continue on the successful path it had charted for many years under "light-touch" regulation.

H. No-blocking, no-throttling and transparency rules with an antitrust backstop are more than sufficient to protect competition.

77. With limited exceptions, economists view regulation as an appropriate solution only where there is no effective competition, such as industries where large economies of scale create natural monopolies (and even there, only to the smallest degree required to solve the problem). But, where effective competition is present, as in the present case, competition should be allowed to determine market outcomes, and there is certainly no sound basis for common carrier regulation on top of no-blocking, no-throttling and transparency requirements, particularly given that antitrust laws provide a backstop. For the reasons we discuss below, this is true even if one concludes competition may not work perfectly in all cases, with isolated incidents of market failures.

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112. Title II Order, ¶ 83. 2010 Order, ¶ 25.

113. See, for example, Michael Katz, "Wither U.S. Net Neutrality Regulation?" 50 Review of Industrial Organization (2017); Keith Hylton, "Law, Social Welfare, and Net Neutrality," 50 Review of Industrial Organization (2017); and Joseph Farrell, "Some Simple Analytics of Vertically Linked Markets," 50 Review of Industrial Organization (2017).

78. As discussed above, there is a general industry consensus that bright-line no-blocking and no-throttling rules should be retained, and of course antitrust will remain as a backstop. Regulation beyond such light-touch intervention can be a problematic means of addressing a risk of occasional market failure because it can limit beneficial behavior as well. As noted by Prof. Hylton, "[a]ntitrust laws already exist for regulating anticompetitive conduct, and they attempt to regulate with a finer brush than the net neutrality rule."[114] Indeed, most markets that are effectively competitive, like broadband Internet access, function well on their own and generally do not require antitrust intervention. Hence, it may never be necessary to invoke the antitrust laws, but they are present as a backstop. And importantly, they are a backstop that seeks to protect and enhance competition, not subvert and replace competition with the type of regulatory oversight that comes with monopoly era common carrier regulation.

79. Basic transparency regulation, which there is also broad support for, further facilitates competition by giving consumers information about important network practices at the various providers of broadband Internet access services.

80. The specific examples of conduct cited by the Title II Order as raising concern are not only few in number, they actually support our point, because they are the type of conduct that would be addressed by no-blocking and no-throttling rules and/or antitrust laws eif they were found to raise any legitimate concerns.[115] In fact, the Title II Order does not cite a single example of consumer-harming Internet Service Provider conduct that could not be addressed without Title II regulation.

81. The examples cited in the Title II Order (and our comments on them) are as follows.

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114. Keith Hylton, "Law, Social Welfare, and Net Neutrality," 50 Review of Industrial Organization (2017), at 424.

115. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 472.

- First, "Madison River telephone companies' denial of ports to 'voice over Internet protocol' (VoIP) providers, which was subject to an FCC order in 2005."[116] This small rural telephone company deployed broadband services and wished to bundle those services with its own telephone services. The Commission resolved the matter and required Madison River to allow access to competing VoIP providers.[117] It is not clear why this example is cited to support a need for Title II regulation since the matter was resolved under the light-touch regulation in place at the time.

- Second, "Comcast's deferral of delivery of BitTorrent traffic to off-peak delivery times, which was subject to an FCC order in 2008."[118] "Comcast began delaying BitTorrent traffic transmission until off-peak times, which it justified as a means to ensure that other customers would not suffer a loss of service quality as they used the Internet for more conventional emailing and web surfing."[119] The Commission claimed that Comcast's motive for disfavoring BitTorrent was to reduce competition from an alternative video provider, *i.e.*, to raise rivals' costs.[120] Comcast defended its actions as reasonable traffic management techniques.[121] Comcast noted that, since peer-to-peer ("P2P") applications, such as BitTorrent, are very bandwidth intensive, a small number of P2P users can generate traffic that causes significant congestion and degrades the services provided to other users. As Comcast noted, "as few as 15 simultaneous BitTorrent sessions (i.e., individual file transfers, multiple ones of which may be coming from a single computer)

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116. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 471.

117. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 476.

118. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 471.

119. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 477.

120. Federal Communications Commission press release, "Commission orders Comcast to end discriminatory network management practices," August 1, 2008, https://apps.fcc.gov/edocs_public/attachmatch/DOC-284286A1.pdf

121. Comments of Comcast Corporation, February 12, 2008, In the Matter of Broadband Industry Practices, WC Docket 07-52, at 24-32.

in a geographic area served by a single node … can severely slow down the time it takes for all users in that area to surf the Web and can degrade the quality and reliability of VoIP calls."[122] The matter was resolved without Title II regulation, and any future conduct of this type would be adequately addressed by a no-blocking/no-throttling rule.

- Third, "AT&T's refusal to provide FaceTime video calling via iPhones over its 3G network [in 2012]. …"[123] In 2012, Apple made FaceTime available on cellular networks for the first time, and it included FaceTime as a preloaded app on the iPhone. Although FaceTime had been, and continued to be, available to AT&T customers via Wi-Fi, AT&T decided to phase in the use of FaceTime on its cellular network, citing traffic management needs.[124] More specifically, AT&T was concerned that, consistent with its prior experience with the launch of the iPhone, introduction of FaceTime would result in an explosion in network usage that could have harmed all users.[125] Although the Title II Order cites this as an example of "practices that pose a threat to Internet openness by harming other network providers, edge providers, and end users," no enforcement action was ever brought.[126] And consistent with AT&T's statements that the company was following a process to ensure customer usage of the application would not compromise network performance, AT&T gradually enabled FaceTime over cellular, ultimately enabling it for customers on all cellular data plans within a few months. It is difficult to see how this is anything other than the type of reasonable network management practice that even Title II rules would permit.

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122. Comments of Comcast Corporation, February 12, 2008, In the Matter of Broadband Industry Practices, WC Docket 07-52, at 27.

123. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 472.

124. David Kravets, "AT&T Holding FaceTime Hostage is No Net-Neutrality Breach," Wired.com, August 22, 2012.

125. Comments of AT&T Services, Inc., June 15, 2014, In the Matter of Protecting and Promoting the Open Internet, GN Docket 14-28, at 24-25.

126. Title II Order, ¶¶ 78-79.

- Finally, "Comcast and other major [broadband] providers' practice of charging Netflix for delivery of traffic, with service throttled until such payments were agreed upon."[127] The Comcast-Netflix dispute arose when Netflix began to transition its traffic off of content delivery networks ("CDNs") and onto transit providers with settlement-free routes into Comcast's network. Given the increasing demand for Netflix content, this in turn resulted in increased congestion at transit providers' interconnection connection points to Comcast's network. Comcast and Netflix eventually resolved the dispute with Netflix making payments to Comcast to increase capacity.[128] This appears to be a normal commercial dispute, with no basis to conclude there was any need for regulatory intervention.

82. Thus, the examples of "troublesome" conduct that have been raised offer no support for Title II regulation. These examples were resolved without any such regulation, and thus actually demonstrate that light-touch regulation (no-blocking and no-throttling rules) with an antitrust law backstop are sufficient to prevent any anticompetitive behavior. This is a preferable approach to attempting to replace competition with broad-reaching common carrier regulation, particularly given the high costs of such regulation, including those laid out in the next section.

IV. The costs of Title II regulation: Reduced investment incentives.

83. Having shown that there would be little benefit from Title II regulation, we now turn to the cost side of the ledger, showing that costs clearly outweigh any limited benefits of Title II regulation. We conservatively focus on the costs imposed by Title II regulation through their negative impact on investment, particularly since *stimulating investment* was part of the Commission's justification for increased regulation in the first place. In particular, we:

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127. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 472.

128. See Michael Liedtke, "Q&A: Breakthrough deal between Netflix, Comcast should produce better Internet video streaming," U.S. News & World Report, February 24, 2014, https://www.usnews.com/news/business/articles/2014/02/24/getting-a-clearer-picture-on-netflix-comcast-deal; https://qz.com/256586/the-inside-story-of-how-netflix-came-to-pay-comcast-for-internet-traffic/.

- Explain that the reclassification of broadband Internet access service under Title II and imposition of the Internet Conduct Standard create substantial uncertainty about the forms that future regulatory burdens may take.

- Document the well-established body of theoretical and empirical economic literature that establishes that regulatory uncertainty generally, and Title II regulation specifically, dampens investment incentives.

- Conclude that Title II regulation already has imposed substantial costs on marketplace outcomes due to reduced investment incentives. Negatively affected investment is not limited to capital investment in physical equipment, but also includes research, development and implementation, both for technologies and for services.

84. To be clear (and as is apparent from Section III, above), we certainly do recognize that there is investment today. This investment demonstrates the power of competition even in the presence of costly regulation. But, as we explain in the remainder of this section, both investment and competition would be greater – and consumers would be better off – without Title II regulation.

A. The Title II Order and Internet Conduct Standard create significant regulatory uncertainty and the risk of significant regulatory creep.

85. Although the Title II Order forbore from many provisions of the Communications Act that would have applied to broadband providers as a result of reclassifying Internet access service as a telecommunications service, the Title II Order retained the core elements of Title II: sections 201 and 202. The Title II Order further held sections 201 and 202 should be enforceable through damages complaints under section 208, in addition to forfeitures and other enforcement related provisions of the Act. The Title II Order also reserves authority to re-impose the substantive requirements of the provisions from which it forbore through enforcement of sections 201 and 202.

86. As such, despite the Title II Order's statements touting its extensive forbearance from some provisions of Title II, the imposition of Title II classification immediately went far beyond

the Commission's historical "light-touch" approach and created great uncertainty about the regulatory approach going forward. In particular, Sections 201 and 202 broadly prohibit "unreasonable" and "discriminatory" practices. These provisions were enacted by Congress over 80 years ago to regulate legacy, monopoly-era telephone networks. There is no historical precedent for how these broad concepts apply to modern Internet services, creating great uncertainty going forward.

87. The Title II Order then adopted implementing regulations, but those regulations are themselves extremely broad with deliberately ill-defined limits. The Internet Conduct Standard, which the Title II Order characterizes as the "application" of sections 201 and 202 to the Internet, simply indicates that the Commission has the authority to condemn any conduct deemed to be "unfair," while leaving uncertain how such a determination of "unfairness" might be made.[129] The Internet Conduct Standard "allows the Commission to prohibit practices that it determines unreasonably interfere with or unreasonably disadvantage the ability of consumers to reach the Internet content, services, and applications of their choosing or of online content, applications, and service providers to access consumers," as well as "discretion to prohibit any Internet service provider practice that it believes violates any one of the non-exhaustive list of factors adopted in the Title II Order."[130] The factors listed offer little guidance since they are only vaguely described, subject to discretion, and "non-exhaustive," meaning that the Commission could find that other, unidentified factors are operative instead. Such sweeping and ill-defined language is exactly the sort of regulation that creates substantial investment-chilling uncertainty about the scope and nature of regulation that will be imposed going forward.

88. Further increasing the uncertainty from the Internet Conduct Standard is the fact that its stated purpose is not only to cover conduct that would run afoul of traditional antitrust concerns but to cover unspecified conduct related to a wide range of ill-defined factors such as "free expression," or additional factors to be identified later.[131] This goes beyond the already substantial uncertainty created from the vagueness of the specific criteria in the Internet Conduct

129. Title II Order, ¶ 137.

130. NPRM, ¶ 72.

131. Title II Order, ¶¶ 138, 143.

Standard, to actively promoting the idea that past and future conduct will be evaluated based on future, unspecified regulation. Indeed at a Commission open meeting discussing the regulation, then-Chairman Wheeler explained that he himself did not really know what conduct might be proscribed by the Internet Conduct Standard.[132]

89. Although the Title II Order claims clarity will be provided via non-binding advisory opinions,[133] the creation of such a process is an acknowledgement of the uncertainty created by the new rules. Nor is the process itself useful for resolving uncertainty, since such advisory opinions cannot be obtained for existing conduct, conduct subject to a pending inquiry, or conduct that is not sufficiently imminent. In addition, the Enforcement Bureau is not required to even respond to a request or to respond on any particular schedule. Indeed, seeking guidance can itself trigger enforcement.[134] Furthermore, even if the Enforcement Bureau provided an advisory opinion with a definitive and positive answer, it would still be non-binding. Given that the vaguely defined Internet Conduct Standard offers a wide scope for regulating new services and strategies, it is hard to see how this process would provide much clarity or assurance to firms contemplating investments.

90. The Title II Order creates further regulatory uncertainty via a serious risk of "regulatory opportunism." Regulatory opportunism occurs when regulators adopt one policy *ex ante* which impacts regulated firms' investment decisions, but then implement a different regulatory policy *ex post* (*i.e.*, after the regulated firms invest).[135] If the optimal *ex ante* policy differs from the

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132. Federal Communications Commission, February 26, 2015 open meeting video, available at https://www.fcc.gov/news-events/events/2015/02/february-2015-open-commission-meeting, at166:17-166:54.

133. Title II Order, note 332.

134. Title II Order, ¶¶ 231-235.

135. See, for example, Christopher Decker, Modern Economic Regulation: An Introduction to Theory and Practice, Cambridge University Press (2015), at 171. ("In principle, if a regulator can commit ex ante to access prices that will apply once an investment is sunk, and which allow for recovery of investment costs, this might facilitate efficient investment in network infrastructure… In practice, however, regulators do not generally have absolute discretion over future access prices and, once an investment is made, can be constrained by various legal, economic and political pressures to limit access prices, all of which can reduce the credibility of any commitment to ex ante access prices.").

optimal *ex post* policy, regulators face a "time-inconsistency" or "credible commitment" problem. The easier it is for regulators to reverse or change regulation, the greater the concern. For example, under Title II, regulators may claim that they will not interfere unnecessarily with the Internet, but may later reverse themselves in the face of political pressure. More generally, the Title II classification makes additional regulation substantially easier than the prior "light-touch" regulatory regime. Claims in the Title II Order about future "light-touch" regulation are simply not particularly credible when accompanied by such sweeping changes as reclassification and imposition of the Internet Conduct standard. Such claims become even less credible when accompanied by vague statements about future investigations and "non-exhaustive" lists of potential problems.[136]

91. One particular form of regulatory uncertainty, "regulatory creep," occurs when regulation starts as modest but steadily expands over time, in way that were unanticipated at the start of regulation. History here shows the risk of regulatory creep is real.

- Early Commission proceedings on "net neutrality" were focused on no-blocking and no-throttling rules. Chairman Powell at the time referred to the Commission's policies, adopted in 2005, as the "four Internet freedoms," with a goal of "empowering consumers without regulating the Internet."[137] Chairman Powell also noted that "broadband

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See also, Balázs Égert,"Infrastructure Investment in Network Industries: The Role of Incentive Regulation and Regulatory Independence in OECD Countries," chapter 6 in Arnold Picot, Massimo Florio, Nico Grove & Johann Kranz, eds., The Economics of Infrastructure Provisioning: The Changing Role of the State, MIT Press (2015), at 178-81; Robert Baldwin, Martin Cave & Martin Lodge, Understanding Regulation: Theory, Strategy, and Practice, Oxford University Press, second edition (2013), at 56-57, 376 & 415-18; Jean-Jacques Laffont & Jean Tirole, Competition in Telecommunications, MIT Press (2001), at 55-56; and Mark Armstrong, Simon Cowan & John Vickers, Regulatory Reform: Economic Analysis and British Experience, MIT Press (1994), at 85-91 & 172-73.

136. Title II Order, ¶ 138.

137. The "four Internet freedoms" are freedom to access content, use applications, attach personal devices and obtain service plan information. Federal Communications Commission, Policy Statement in the Matter of Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, FCC 05-151, September 23, 2005. See

consumers generally enjoy such internet freedom. They can access and use the content, applications and devices of their choice. … These general conditions suggest that many, if not most, in the industry recognize that providing such access and information is in their own self-interest, particularly as infrastructure and developers struggle to discover valuable uses that will enable them to recoup their substantial investments in high-speed Internet technologies."[138]

- The Commission expanded the scope of regulation of broadband Internet access in the 2010 Order. This order went beyond no-blocking rules, and adopted rules on transparency, and prohibited unreasonable discrimination.[139] However, it did not impose core Title II obligations on Internet providers and also specifically exempted mobile providers from key obligations, such as any nondiscrimination rule.[140]

- After the D.C. Circuit struck down the 2010 Order, the Commission proposed in 2014 to bar blocking, throttling and "commercially unreasonable actions"[141] At the same time, it stated that it did *not* intend to adopt common carrier regulation under Title II.

- Then, after intervention by the White House, the Commission took a different and far more intrusive approach than previously contemplated in the 2014 NPRM.[142] As noted, in the Title II Order, it reclassified Internet services as common carrier services and created the Internet Conduct Standard, which is anything but a "bright-line" rule.

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also Remarks of Michael Powell, Chairman, FCC, February 8, 2004, https://apps.fcc.gov/edocs_public/attachmatch/DOC-243556A1.pdf.

138. Remarks of Michael Powell, Chairman, FCC, February 8, 2004, https://apps.fcc.gov/edocs_public/attachmatch/DOC-243556A1.pdf.

139. 2010 Order, ¶¶ 1, 151-160.

140. 2010 Order, ¶ 94.

141. Federal Communications Commission, Notice of Proposed Rulemaking in the Matter of Protecting and Promoting the Open Internet, FCC 14-61, May 15, 2014.

142. Gautham Nagesh & Brody Mullins, "Net Neutrality: How White House Thwarted FCC Chief," The Wall Street Journal, February 5, 2015.

- Since then, we have observed further regulatory creep such as the zero-rating investigation discussed in section V below.

92. Given this history and the Commission's explicit reservation of a right to condemn conduct based on additional, unspecified considerations in the future, the industry has every reason to expect further regulation, expanded application of Title II and the Internet Conduct Standard in novel ways, and regulation of more and more services. As we now explain, these are the exact conditions that lead to regulatory uncertainty that chills investments, as firms evaluate investments against the risk of future regulation that may stifle the ability to capture the full return on those investments.

93. Also given the vagueness in the regulation and the extent to which it has already expanded the scope of conduct subject to FCC regulatory oversight, providers are left uncertain whether *any* actions that differentiate their offerings – particularly actions that work with edge providers to develop new Internet services or otherwise facilitate the development of a vibrant two-sided market – will be deemed violations of the Internet Conduct Standard. This fear has likely been heightened significantly by the experience with zero-rating programs, described in more detail in Section V below, in which even attempts to cut consumer prices by allowing edge providers to effectively purchase data on behalf of their customers, thus exempting that traffic from data allowances, were investigated and indicated to be potential violations. The vagueness of the Internet Conduct Standard in particular allows for extreme regulation, and there are various parties pressing for just such actions.

B. The economic literature indicates that, due to regulatory uncertainty and burdens, the Title II Order reduces investment incentives.

94. Basic economic theory shows that the uncertainty created by regulation depresses investment incentives.[143] Because the Title II Order and Internet Conduct Standard introduce so

143. Some forms of price regulation, such as "rate of return" regulation, can create incentives for regulated firms to inefficiently over-invest (*e.g.*, "gold-plating"). That type of regulation is not relevant here since the Title II regulation in question is not rate of return regulation.

much regulatory uncertainty for broadband Internet service providers, they reduce incentives for firms to make investments, especially irreversible (or sunk) investments that will not be recoupable if the investment fails to deliver sufficient returns. Such sunk investments are common in this industry. Hence it is not surprising that, although Title II regulation has not been in effect for a significant time, there is already emerging empirical evidence documenting such investment suppressing effects.

1. Economic theory demonstrates that regulatory uncertainty and opportunism reduce incentives to invest

95. The Title II Order and the Internet Conduct Standard reduce incentives to invest through increased regulatory uncertainty and, if regulatory creep continues, increased regulatory burdens. In this section we explain the mechanisms for these reduced investment incentives with reference to the well-established economic literature on this topic.

96. Uncertainty about the course of future regulation can deter investment in several related ways.[144] **First**, investments are riskier to undertake when there is uncertainty about how the investment will be treated in the future, such as how existing rules will be applied. For example, regulatory uncertainty creates increased risk that a new product, service, or investment may later be found unlawful or otherwise restricted in ways that reduce returns. As a fundamental matter of financial economics, such risk depresses investment incentives. The reason is that additional risk raises the rate of return (or "hurdle rate") a firm will require to undertake the investment.[145] Just as investors require higher promised interest rates when the risk of nonpayment or partial payment on bonds goes up, firms will require higher hurdle rates on their investments if the risk of regulation decreases expected future returns on those investments. This effect is also discussed in the economic literature on the option value of waiting. When "the outcome of a process is uncertain and potentially detrimental for a company, the option value of waiting to

144. To be clear, regulation that is known with certainty to prohibit or constrain efficient actions also deters investment.

145. See, for example, Richard Brealey, Stewart Myers & Franklin Allen, Principles of Corporate Finance, Ninth Edition, McGraw-Hill (2008), Part Two: Risk.

invest increases, which rationally compels the company to postpone investments until uncertainty is partly or fully resolved…"[146]

97. Bottom line, the increase in risk due to uncertainty means fewer investment projects will be undertaken. The higher a firm's required rate of return, the less likely a prospective investment's expected return will meet or exceed it. Thus, fewer prospective investments will satisfy the firm's investment criteria (*i.e.*, a rule that the firm will invest only in projects whose expected returns meet or exceed the required rate of return), and investment falls. The net result may be firms investing instead in less productive or socially beneficial alternatives, or not investing at all.

98. **Second,** additional investment-depressing risk is created by the problem of regulatory opportunism (or regulatory creep), in which additional regulations are imposed *ex post*, after sunk investments are made.[147] Once this happens, incentives for future investment in new products or services are diminished because firms will naturally be concerned that after making those investments, regulators will later determine that those products or services are unlawful or

146. Juan Lopez, Alice Sakhel & Timo Busch, "Corporate Investments and Environmental Regulation: The Role of Regulatory Uncertainty, Regulation-Induced Uncertainty, and Investment History," 35 European Management Journal (2017) 91-101, at 92. See also James Alleman & Eli Noam (eds.), The New Investment Theory of Real Options and its Implication for Telecommunications Economics, Kluwer (1999).

147. See, for example, Mark Armstrong & David E.M. Sappington, "Recent Developments in the Theory of Regulation," chapter 27 of Mark Armstrong & Robert Porter, eds., Handbook of Industrial Organization, volume 3, Elsevier (2007), at 1631-32. ("Once the firm has made irreversible investments, a regulator with limited commitment powers may choose not to compensate the firm for those investments, in an attempt to deliver the maximum future benefits to consumers. This expropriation might take the form of low mandated future prices. Alternatively, the expropriation might arise in the form of permitting entry into the industry… When it anticipates expropriation of some form, the firm will typically undertake too little investment."). See also, Alfred Kahn, "Letting Go: Deregulating the Process of Deregulation," MSU Public Utility Papers (1998), at 107. ("The economic underpinning of traditional regulation was the recognition that if investors were promised a reasonable opportunity to recover those costs, the utilities' ability to attract capital would be ensured. … First, the experience of having had such rules of the regulatory game changed in such a way as to deny them recovery of costs that they had been entitled to recover under the preceding regulatory regime cannot but diminish their incentives to engage in such investments in the future.").

should be subject to new restrictions, reducing the expected returns. Notably, regulatory creep can occur even when a regulator may believe the *ex-post* restrictions it is imposing are designed to benefit consumers. Patents provide a useful analogy: Removing intellectual property protections soon after creation of an invention will reduce prices to consumers for that product in the short-term, but will reduce overall investment in the long-term. The patent system is based on the recognition of this trade-off and the importance of preserving incentives for innovation.

99. To avoid this problem, it is important that regulators credibly commit to minimizing *ex post* regulation. Indeed, the economic literature on regulation addresses whether, and if so how, regulators can credibly commit not to engage in such behavior. For example, Prof. Helm notes that "[r]egulation is, after all, a repeated game. On the institutional front, limiting the personal discretion of individual regulators and defining the (political) trade-offs can help to stabilize the framework."[148]

100. Unfortunately, Title II regulation sends exactly the wrong signal, as it undercuts the credibility of commitments not to impose *ex post* regulation. In particular, the Title II Order sent a signal that the Commission was increasing regulation of broadband Internet access services beyond what it had originally put in place, *and* made it far easier for the Commission to impose *further* restrictions. That is, after decades of "light-touch" regulation and hundreds of billions of dollars of sunk investments, the Title II Order classified those services under Title II, imposing additional regulatory burdens and threatening still greater regulatory burdens.

101. As long as Title II common carrier regulation is in place, fears of regulatory creep will likely be high. For example, as noted by Prof. Brennan, broadband providers might well be concerned that the claims of light regulation going forward are "neither legally nor politically credible."[149] And the situation is made worse by the (apparently intentional) vagueness of the

148. See, for example, Dieter Helm, "Credibility, Commitment and Regulation: Ex Ante Price Caps and Ex Post Interventions," chapter 9 of William Hogan & Federico Sturzenegger, eds., The Natural Resources Trap: Private Investment without Public Commitment, MIT Press (2010), at 318.

149. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 480.

Internet Conduct Standard, which means that, as Prof. Brennan explains "providers may have some reason to think that their profits may shrink from regulatory or legal consequences of [the Title II Order] that may not currently be explicit within it."[150]

102. Putting the above points together, Title II regulation increases the return firms will require before undertaking investment – due to the substantial increase in risk arising from uncertainty about the form that regulation will take going forward and the likelihood of *ex post* increase in regulation even following *ex ante* promises to limit regulation. It also reduces the actual return likely to be achieved due to the direct and known costs associated with complying with the regulations. The net effect is to depress investments in a fast moving industry in which investments and innovation are critical for to edge providers and consumers.

103. In contrast, reversing the Title II classification and attendant "conduct" regulation and adopting clear limiting principles on how the Commission will exercise any regulatory authority over broadband service in the future would send a signal to the marketplace that the Commission is not likely to impose *ex post* costly regulation on new products and services developed by providers of Internet services. As noted by Profs. Armstrong and Sappington, "[o]ne natural way to overcome the temptation for a regulator to behave opportunistically is to limit the regulator's policy discretion."[151] A credible commitment to "light-touch" regulation, such as by reversing the classification of Internet services under Title II and conditionally forbearing from all elements of Title II, is certainly more conducive to costly, sunk investment than having Title II regulation and the Internet Conduct Standard hanging over the industry, potentially to be used in unanticipated ways that undermine the bases upon which the investment rested.

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150. Timothy Brennan, "The Post-Internet Order Broadband Sector: Lessons from the Pre-Open Internet Order Experience," 50 Review of Industrial Organization (2017), at 480-81.

151. See, for example, Mark Armstrong & David E.M. Sappington, "Recent Developments in the Theory of Regulation," chapter 27 of Mark Armstrong & Robert Porter, eds., Handbook of Industrial Organization, volume 3, Elsevier (2007), at 1632.

2. Empirical evidence confirms that Title II classification reduces investment incentives

104. As discussed below, available empirical evidence generally supports the predictions of economic theory that Title II regulation will depress investment. We reach this conclusion despite the Title II Order's claim that investment did not decline after the Commission's earlier attempt to regulate the Internet in the 2010 Order. Studying investment effects of the 2010 Order provides very little insight into the effects of regulation for several reasons. First, the 2010 Order did not impose section 201 and 202 common carrier obligations, did not include the Internet Conduct Standard, exempted mobile providers from key rules, and did not subject providers to complaints under section 208 for damages, further reducing the guidance one can draw from the 2010 experience to the current situation.[152] Moreover, it is unclear what level of investment would have prevailed absent the 2010 Order's regulations – even an increase in investment could reflect reduction in the investment that would have occurred without regulation. Additionally, the provisions of the 2010 Order were immediately challenged, and the courts overturned the rules, preventing the longer term investment suppressing effects.

105. Even setting those issues aside, Profs. Hazlett and Wright actually find that, contrary to the statements in the Title II Order, broadband capital investment *fell* following the 2010 Order, with the Commission's claims to the contrary representing faulty analysis. In particular, they noted that the numbers in the Title II Order were not adjusted for inflation, and that doing so reversed the conclusion expressed in the Title II Order. "Adjusting simply for inflation, the three-year period (2011-2013) that is cited by the [Title II Order] as evidencing an increase in capital spending was actually lower than all but three of the other 15 periods (using 3-year rolling averages) since 1998."[153]

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152. See, generally, 2010 Order; Thomas Hazlett & Joshua D. Wright, "The Effect of Regulation on Broadband Markets: Evaluating the Empirical Evidence in the FCC's 2015 'Open Internet' Order," 50 Review of Industrial Organization (2017) 487-507, at 503.

153. Thomas Hazlett & Joshua D. Wright, "The Effect of Regulation on Broadband Markets: Evaluating the Empirical Evidence in the FCC's 2015 'Open Internet' Order," 50 Review of Industrial Organization (2017) 487-507, at 503.

106. Other analysts have also found that investment has declined following the Title II Order. For example, the Progressive Policy Institute found that "increased regulatory uncertainty, combined with normal business decisions, mean that the companies in [telecom] had a net decrease in domestic capital spending in 2015."[154] The Institute points out that a "vitally-important policy challenge … is getting regulation out of the way of investment. That's especially true in … telecom, where the FCC recently added more regulations on broadband providers and potentially undercut the future incentives for capital investment."[155] Similarly, USTelecom stated recently that its "analysis strongly suggests that investment in 2016 continued to trend downward following the" Title II Order.[156]

107. Some commentators have claimed that investment has increased since the Title II Order,[157] and therefore there has been no investment dampening effect from the Title II Order. That does not follow. As we have discussed, competition is a powerful force that ensures continuing investment, but economics makes perfectly clear that investment incentives would be even greater absent Title II regulation. Similar arguments are sometimes advanced in price fixing litigation that because a downstream industry is successful, there cannot have been anticompetitive action upstream. Again, that does not follow. A successful automobile industry does not mean that OPEC was ineffective at rising oil prices, or that those higher oil prices had no impact on automobile sales.

108. In any event, the "tests" some commentators have pointed to in claiming that investment has risen in absolute terms following the Title II Order are flawed for several reasons. Most notably, these "tests" are comparisons of aggregate levels of investments in short windows after the adoption of Title II regulation, which is a weak test of the effect of regulation on investment incentives. Additionally, these analyses fail to control for obvious factors such as the rate of

154. Michelle Di Ionno & Michael Mandel, "Investment Heroes 2016," Progressive Policy Institute, October 2016, p. 6.

155. Michelle Di Ionno & Michael Mandel, "Investment Heroes 2016," Progressive Policy Institute, October 2016, p. 3.

156. Patrick Brogan, "Broadband Investment Heads in the Wrong Direction," May 5, 2017.

157. See, for example, S. Derek Turner, "It's Working: How the Internet Access and Online Video Markets Are Thriving in the Title II Era," FreePress, May 2017.

inflation (and other accounting-related adjustments). For example, some claims that investment has increased depend on counting investment in Mexico.[158] After adjusting for inflation and location of investment, these studies generally show that investment has declined.[159] Ultimately, what this mixed empirical record shows is that empirical inferences one way or the other are difficult to draw using simple analyses of investment levels over time, particularly given the limited time period. In contrast, the economic predictions for the longer term effect are clear: Title II regulation reduces incentives to invest.[160]

109. A better empirical approach, which has been pursued by other analysts, is to look at other instances of Title II regulation where some market participants were regulated and others were not, thus enabling direct econometric estimation of the effects of regulation against an unregulated benchmark. Such analysis has found that Title II regulation of broadband services has significantly depressed investment. For example, a recent study of the effect of Title II regulation on broadband markets concluded that "mobile services and broadband markets have

158. See, for example, Patrick Brogan, "Broadband Investment Heads in the Wrong Direction," USTelecom, May 5, 2017; Doug Brake, "Broadband Myth Series, Part 1: What Financial Data Shows About the Impact of Title II on ISP Investment," Information Technology & Innovation Foundation, June 2, 2017; Hal Singer, "The Days of Common Carriage for Broadband are Numbered," Forbes, May 17, 2017; and Hal Singer, "Tales from Econ Cloud Cuckoo Land," June 12, 2017, https://haljsinger.wordpress.com.

159. See, for example, Patrick Brogan, "Broadband Investment Heads in the Wrong Direction," USTelecom, May 5, 2017; Doug Brake, "Broadband Myth Series, Part 1: What Financial Data Shows About the Impact of Title II on ISP Investment," Information Technology & Innovation Foundation, June 2, 2017; Hal Singer, "The Days of Common Carriage for Broadband are Numbered," Forbes, May 17, 2017; and Hal Singer, "Tales from Econ Cloud Cuckoo Land," June 12, 2017, https://haljsinger.wordpress.com.

160. This conclusion is consistent with empirical analyses that find access regulation in Europe reduce telecom firms' investment incentives and industry investments. See, for example, Michał Grajek & Lars-Hendrik Röller, "Regulation and Investment in Network Industries: Evidence from European Telecoms," 55 Journal of Law and Economics (2012) 189-216; and Wolfgang Briglauer, Carlo Cambini & Michał Grajek, "Speeding up the internet: regulation and investment in European fiber optic infrastructure", ESMT Working Paper 17-02, May 3, 2017, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2962532.

shown notable growth in response to deregulatory events that *reduce* Title II requirements."[161] Incumbent telephone companies were initially subject to "line sharing" obligations to promote competitive DSL services, and then freed from those obligations, while cable companies never faced any similar requirements. Profs. Hazlett and Wright summarize their analysis of the development of DSL and cable modems in the U.S and Canada as follows:

> Perhaps most dramatic are the results seen in broadband markets where policy variability has revealed market reactions to common carrier regulation. When cable modem services developed in the 1990s, they were unregulated and out-performed DSL, as the FCC observed. This deployment difference was the predicate for removing telephone network sharing and Title II requirements in 2003-2005. Markets quickly reacted. Enhanced broadband deployment was observed for DSL and fiber optic technologies, and competitive network performance dramatically improved.[162]

V. Case study: The zero-rating investigation illustrates the regulatory uncertainty and regulatory creep created by Title II regulation.

110. The Commission's zero-rating investigation provides a clear example of how the Title II Order and the Internet Conduct Standard create regulatory uncertainty and encourage regulatory creep.

111. By way of background, over the past few years, several wireless providers introduced zero-rated content, which effectively cut data prices to consumers by zero-rating participating content such that it does not count against data caps. For example, AT&T Mobility launched a sponsored data program in January 2014,[163] and, beginning September 2016, DIRECTV

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161. Thomas Hazlett & Joshua D. Wright, "The Effect of Regulation on Broadband Markets: Evaluating the Empirical Evidence in the FCC's 2015 'Open Internet' Order," 50 Review of Industrial Organization (2017) 487-507, at 487. Emphasis in original.

162. Thomas Hazlett & Joshua D. Wright, "The Effect of Regulation on Broadband Markets: Evaluating the Empirical Evidence in the FCC's 2015 'Open Internet' Order," 50 Review of Industrial Organization (2017) 487-507, at 498-499, 504. See also Thomas Hazlett & A. Caliskan, "Natural experiments in broadband regulation," 7 Review of Network Economics 4 (2008).

163. AT&T press release, "AT&T Introduces Sponsored Data for Mobile Data Subscribers," January 6, 2014, https://www.att.com/gen/press-

participated in that program, offering its subscribers "Data Free TV."[164] Through this initiative, consumers could stream DIRECTV content on their mobile devices without having that content count against their data allowances or incurring any incremental charge.

112. T-Mobile similarly announced Binge On in late 2015,[165] and Verizon introduced FreeBee Data in January 2016,[166] and zero-rated its over-the-top video service Go90 in March 2016.[167] In each of these instances, wireless providers were offering additional data and video content to consumers at effectively zero prices. In other words, these programs, like DIRECTV's Data Free TV initiative, cut prices for consumers.

113. Importantly, this zero-rating initiative is economically equivalent to a program through which DIRECTV reimburses its customers for any incremental data charges they would otherwise incur while streaming DIRECTV content on AT&T's cellular network, a pro-consumer price cut. The Commission has cited these types of discount arrangements as procompetitive benefits in the AT&T/DIRECTV merger.[168] That is, zero-rating, by itself, *lowers* consumers' data costs, and is a pro-consumer outcome. Concerns that price cuts disadvantage

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room?pid=25183&cdvn=news&newsarticleid=37366. For further discussion, see Christopher Yoo, "Avoiding the Pitfalls of Net Uniformity: Zero Rating and Nondiscrimination," 50 Review of Industrial Organization (2017).

164. Marguerite Reardon, "FCC slams AT&T and Verizon over zero-rating offers," Cnet, December 2, 2106, https://www.cnet.com/news/fcc-att-verizon-zero-rating-directv-now-go90-net-neutrality/

165. T-Mobile press release, "T-Mobile Unleashes Mobile Video with Binge On," November 10, 2015, https://newsroom.t-mobile.com/media-kits/un-carrier-x.htm.

166. Verizon press release, "Introducing FreeBee Data: The new sponsored data service from Verizon," January 19, 2016, http://www.verizon.com/about/news/introducing-freebee-data-new-sponsored-data-service-verizon

167. Colin Gibbs, "Shammo: Verizon's zero-rated video to launch on Go90 this week," FierceWireless, March 1, 2016, http://www.fiercewireless.com/wireless/shammo-verizon-s-zero-rated-video-to-launch-go90-week

168. AT&T/DIRECTV Merger Order, ¶¶ 3-4.

competitors are treated with heavy skepticism in antitrust for many reasons, including the fact that scrutinizing price cuts discourages firms from making them in the first place.[169]

114. Any potential "predation" concern in this context fails because, among other things, neither AT&T nor its affiliates have or could reasonably hope to gain substantial market power, and thus they have no realistic prospect of recoupment. AT&T, including resellers of its wireless services, has less than a third of wireless revenues,[170] and AT&T's cellular network accounts for only a tiny portion of video content viewing in the U.S. Even if AT&T foreclosed other content providers on their network entirely, they could not plausibly threaten the viability of competing content providers or cause them to exit.

115. And, in fact, AT&T allowed *other firms* to sponsor data at AT&T's lowest wholesale rate, no matter how small the volume of data sponsored. This is the opposite of a "raising rivals' costs" theory, as other firms are now able to sponsor data at lower rates than if they simply reimbursed their customers for any wireless data usage. The rate for data sponsorship is comparable to the lowest data rates that extremely high-volume mobile resellers pay AT&T today and is available regardless of the volume purchased. Even small volumes of data can be sponsored at the same rate received by the high-volume mobile resellers. To actually *raise* rivals' costs, as opposed to cutting prices for its own services, AT&T would need not only to zero-rate DIRECTV content, but then raise the baseline price on *all other content*. Such a strategy would be untenable given the competitive wireless marketplace discussed above. For example, competition has driven all major mobile firms to offer unlimited plans, in which the incremental price of data usage is effectively zero. In such a competitive environment, there is no plausible theory of harm under which AT&T would raise the overall prices of its wireless plans in hope of some small amount of increased DIRECTV usage, and there was no evidence of any such behavior. Instead, the behavior being investigated directly *lowered* consumer prices

169. Of course, efforts that make AT&T more competitive may lead to complaints from AT&T's competitors. However, such complaints are simply an indication that competition is functioning, and sound competition policy is designed to protect consumer welfare, not individual competitors.

170. 19th CMRS Report, Table II.C.2.

and *lowered* the price other content providers would pay if they wished to increase wireless usage of their products.

116. Notwithstanding the competitiveness of the wireless marketplace (as discussed above), the fact that sponsored data programs are effectively a price cut for consumers, and the fact that these programs present no concern under established antitrust economics, the Commission began an investigation of those practices. That the Commission undertook a formal, lengthy investigation of a practice that clearly lowers consumer prices shows how pernicious regulatory creep under the Internet Conduct Standard can be. More than a year later, Commission staff released a "policy review" that warned Data Free TV and Verizon's FreeBee Data programs "may" violate the Internet Conduct Standard. The NPRM succinctly summarizes the results of this investigation:

> After a thirteen-month investigation, the [Commission] did not specifically call for an end to any provider's practices or identify any particular harm from offering consumers free data. … Instead of giving providers clear rules of the road to govern future conduct, [the Commission] put a provider on notice that an enforcement action could be just around the corner. … [This] left Internet service providers with two options: either wait for a regulatory enforcement action that could arrive at some unspecified future point or stop providing consumers with innovative offerings.[171]

117. The Commission's sponsored data investigation exemplifies both the regulatory uncertainty created by and the regulatory creep threatened by the Title II Order. The ambiguity in the regulatory regime adopted in the Title II Order provided the Commission with grounds to condemn a pro-consumer pricing strategy and to engage in direct rate regulation (perversely incentivizing provider to raise prices) despite stating in the Title II Order that it would not do so.[172] The investigation and findings were made possible because the Title II Order's rules were vague and did not provide clear guidance on how it would apply common carrier obligations to the Internet. Certainly, the Commission did not feel it was bound by established economic

171. NPRM, ¶ 74.

172. See, for example, Christopher Yoo, "Avoiding the Pitfalls of Net Uniformity: Zero Rating and Nondiscrimination," 50 Review of Industrial Organization (2017).

principles of antitrust analysis in evaluating sponsored data programs.[173] This outcome is not surprising: The Title II Order itself acknowledged that what guidance was provided was not complete and warned the industry that the criteria used to evaluate compliance with Title II obligations could change at any time.[174]

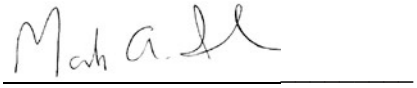
118. Even though the Commission has now (appropriately) ended the sponsored data investigation, this is the type of regulatory creep that chills investment by firms. To the extent the investigation provided guidance on future regulation, that guidance was that firms could expect that additional investigations or enforcement actions would be forthcoming, and that those investigations or enforcement actions might well target pro-consumer price cuts and might well be driven by political pressures. Firms will be less willing to make investments if they expect, based on prior history, to then face regulation (price or otherwise) that makes it less likely that they will be able to recoup the cost of those investments.

173. Wireless Telecommunications Bureau Report: Policy Review of Mobile Broadband Operators' Sponsored Data Offerings for Zero-Rated Content and Services, p. 7 ("the Commission did not adopt the open Internet rules based on a finding that broadband providers have market power, but rather on the Commission's determination that broadband providers function as 'gatekeepers'".). See also Title II Order, note 12. ("these rules do not address, and are not designed to deal with, the acquisition or maintenance of market power or its abuse, real or potential.")

174. NPRM, ¶ 72.

VERIFICATION

I hereby swear under penalty of perjury that, based on the best information available to me, the foregoing is true and correct.



Mark Israel

Dated: July 17, 2017

VERIFICATION

I hereby swear under penalty of perjury that, based on the best information available to me, the foregoing is true and correct.

Allan Shampine

Dated: July 17, 2017

VERIFICATION

I hereby swear under penalty of perjury that, based on the best information available to me, the foregoing is true and correct.

Thomas Stemwedel

Dated: July 17, 2017

Appendix A

Mark A. Israel **June 2017**
Senior Managing Director
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SUMMARY OF PROFESSIONAL EXPERIENCE

- Served as an expert for both the Federal Government and private parties in cases involving industries including fixed and mobile telecommunications, cable television, broadband internet service, social media, other high technology industries, airlines, railroads, shipping, health insurance, financial markets, credit cards, beverages, retail, and many others.
- Testified in Federal Court and appeared in front of government agencies including DOJ, FTC, and FCC, and state agencies on behalf of numerous clients.
- Submitted expert reports in Federal Court, as well affidavits, declarations, and white papers to agencies including DOJ, FTC, FCC, DOT, and state agencies.
- Written numerous academic articles on topics including competition economics, merger policy, telecommunications, airlines, insurance markets, and labor markets. Research published in leading scholarly and applied journals including The American Economic Review, The Rand Journal of Economics, The Review of Industrial Organization, Antitrust Source, and the Global Competition Review, and presented to business, government, and academic audiences around the world.

AREAS OF EXPERTISE

- Antitrust and competition economics; industrial organization economics
- Applied econometrics
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- Ph.D., Economics, STANFORD UNIVERSITY, June 2001.
- M.S., Economics, UNIVERSITY OF WISCONSIN-MADISON, August 1992.
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EMPLOYMENT HISTORY

Compass Lexecon: *Senior Managing Director*, January 2016 – Present.

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Kellogg School of Management, Northwestern University: *Assistant Professor of Management and Strategy*, 2000 – 2006; *Associate Professor of Management and Strategy*, 2007 – 2008.

State Farm Insurance: *Research Administrator*, 1992 – 1995.

RECENT PROFESSIONAL RECOGNITIONS

American Antitrust Institute 2015 Antitrust Enforcement Awards, *Outstanding Antitrust Litigation Achievement in Economics* Finalist.

Global Competition Review Who's Who Legal: Competition 2016, leading Economist.

Global Arbitration Review's 2016 International Who's Who of Commercial Arbitration, leading Expert Witness.

LIVE TESTIMONIAL EXPERIENCE

Testimony as Economic Expert on behalf of Facebook, Inc., *Social Ranger, LLC v. Facebook, Inc.*, In the District Court of Delaware, C.A. No. 14-1525-LPS. Deposition: March 6, 2017.

Testimony as Economic Expert on behalf of Regal Entertainment Group, In the Matter of iPic – *Gold Class Entertainment, LLC, et al., v. Regal Entertainment Group, AMC Entertainment Holdings, Inc., et al.*, In the District Court of Harris County, Texas, 234th Judicial District, No. 2015-68745. Deposition: January 12, 2016, February 15, 2017. Live Trial Testimony: January 21, 2016.

Testimony as Economic Expert on behalf of Anthem Inc., *United States of America, et al. v. Anthem Inc. and Cigna Corp.*, In the District Court of the District of Columbia, No. 16-cv-01493 (ABJ). Deposition: November 9, 2016.

Testimony as Economic Expert on behalf of Defendants, *Darren Ewert v. Nippon Yusen Kabushiki Kaisha et al.*, Supreme Court of British Columbia, No. S-134895. Deposition: September 14, 2016.

Testimony in Commercial Arbitration on Issues Related to Mobile Wireless Competition; New York, NY; April 12, 2016.

Testimony as Economic Expert on behalf of Federal Trade Commission in Re: *Federal Trade Commission et al. v. Sysco Corporation and USF Holding Corp.*, Civil Action No. 15-cv-00256 (APM). Deposition: April 28, 2015. Live Trial Testimony: May 7, May 8, May 14, 2015.

Appearances in Federal Communications Commission, Economists Panels:

- Comcast/Time Warner, January 2015
- AT&T/T-Mobile, July 2011
- Comcast/NBCUniversal, August 2010

Appearance before California Public Utility Commission, Public Hearings on Comcast/Time Warner Merger, Los Angeles, April 2015.

Appearance as Economic Testifying Expert in front of Department of Justice, Federal Trade Commission, Federal Communications Commission, and State Regulatory Agencies in many additional transactions, including: Danaher/NetScout, AT&T/Leap Wireless, T-Mobile/MetroPCS, American Airlines/US Airways, SpectrumCo/Cox/Verizon Wireless, oneworld antitrust immunity application, PepsiCo/bottlers, Houghton Mifflin/Harcourt, Chicago Mercantile Exchange/Chicago Board of Trade.

EXPERT REPORTS, AFFIDAVITS, AND DECLARATIONS

Expert Report of Mark A. Israel, In the Matter of Honeywell International Inc. v. iControl Networks, Inc. and Alarm.com Holdings, Inc., In the United States District Court for the District of New Jersey, No. 2:17-cv-01227, February 26, 2017.

Expert Report of Mark Israel, In the Matter of Social Ranger, LLC v. Facebook, Inc., In the United States District Court for the District of Delaware, C.A. No. 14-1525-LPS, November 23, 2016.

Expert Report of Mark A. Israel, In the Matter between Darren Ewert and DENSO Corporation et al., In the Supreme Court of British Columbia, Vancouver Registry, No. S-135610, November 15, 2016.

Supplemental and Rebuttal Expert Report of Mark A. Israel, In the Matter of United States of America, et al. v. Anthem Inc. and Cigna Corp., In the United States District Court, District of Columbia, No. 16-cv-01493 (ABJ), October 28, 2016.

Expert Report of Mark A. Israel, In the Matter of United States of America, et al. v. Anthem Inc. and Cigna Corp., In the United States District Court, District of Columbia, No. 16-cv-01493 (ABJ), October 7, 2016.

Reply Verified Statement of Mark Israel and Jonathan Orszag, "Review of Commodity, Boxcar, and TOFC/COFC Exemptions," Surface Transportation Board, Docket No. EP 704 (Sub-No. 1), August 26, 2016.

Third Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, "Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM And a Proposed Competitive Market Test," Federal Communications Commission, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, August 9, 2016.

Verified Statement of Mark Israel and Jonathan Orszag, "Review of Commodity, Boxcar, and TOFC/COFC Exemptions," Surface Transportation Board, Docket No. EP 704 (Sub-No. 1), July 26, 2016.

Second Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, "Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM And a Proposed Competitive Market Test," Federal Communications Commission, WC Docket Nos. 16-143, 05-25, RM-10593, June 28, 2016.

Expert Declaration of Mark A. Israel, In the Matter of Liberman Broadcasting, Inc. and LBI Media, Inc. vs. Comcast Corporation and Comcast Cable Communications, LLC, Federal Communications Commission, MB Docket No. 16-121, June 7, 2016.

Expert Report of Mark Israel, In the Matter of La Crosse County, individually, and on behalf of all others similarly situated, v. Trinity Industries, INC. and Trinity Highway Products, LLC, In the United States District Court, Western District of Wisconsin, No. 3:15-cv-00117-scl, May 27, 2016.

Expert Report of Mark A. Israel, In the Matter between Darren Ewert and Nippon Yusen Kabushiki Kaisha, et al., In the Supreme Court of British Columbia, Vancouver Registry, No. S-134895, May 20, 2016.

Second Supplemental Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, In the Matter of Special Access for Price Cap Local Exchange Carriers, Federal Communications Commission, WC Docket No. 05-25, April 20, 2016.

Supplemental Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, In the Matter of Special Access Rates for Price Cap Local Exchange Carriers, Federal Communications Commission, WC Docket No. 05-25, March 24, 2016.

Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, In the Matter of Special Access Rates for Price Cap Local Exchange Carriers, Federal Communications Commission, WC Docket No. 05-25, February 19, 2016.

Declaration of Mark Israel, Daniel Rubinfeld, and Glenn Woroch, "Competitive Analysis of the FCC's Special Access Data Collection," Federal Communications Commission, WC Docket No. 05-25, January 26, 2016.

Declaration of Dr. Mark Israel, In the Matter of iPic – Gold Class Entertainment, LLC, et al., v. Regal Entertainment Group, AMC Entertainment Holdings, Inc., et al., In the District Court of Harris County, Texas, 234th Judicial District, No. 2015-68745, January 18, 2016.

Declaration of Dennis Carlton, Mark Israel, Allan Shampine & Hal Sider, "Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans," Federal Communications Commission, WC Docket No. 15-247, January 7, 2016.

Declaration of Mark A. Israel, Attached to "Response of AT&T Mobility LLC to Notice of Apparent Liability for Forfeiture," Federal Communications Commission, File No. EB-IHD-14-00017504, July 17, 2015.

Reports in Re: Federal Trade Commission et al. v. Sysco Corporation and USF Holding Corp., Civil Action No. 15-cv-00256 (APM). Declaration: February 18, 2015. Report: April 14, 2015. Rebuttal Report: April 21, 2015.

Declaration of Mark A. Israel, Bryan G. M. Keating, and David Weiskopf, "Economic Analysis of the Effect of the Comcast-TWC Transaction on Voice and Broadband Services in California," December 3, 2014.

Expert Report of Mark A. Israel, "Economic Analysis of the Effect of the Comcast-TWC Transaction on Broadband: Reply to Commenters," Federal Communications Commission, MB Docket No. 14-57, September 22, 2014.

Supplemental Declaration of Mark Israel and Allan Shampine, In the Matter of Amendment of the Commission's Rules Related to Retransmission Consent, Appendix A to "Reply Comments of the National Association of Broadcasters," Federal Communications Commission, MB Docket No. 10-71, July 24, 2014.

Declaration of Mark Israel and Allan Shampine, In the Matter of Amendment of the Commission's Rules Related to Retransmission Consent, Appendix B to "Comments of the National Association of Broadcasters," Federal Communications Commission, MB Docket No. 10-71, June 26, 2014.

Expert Report of Mark A. Israel, "Implications of the Comcast/Time Warner Cable Transaction for Broadband Competition," Federal Communications Commission, MB Docket No. 14-57, April 8, 2014.

Declaration of Michael L. Katz, Philip A. Haile, Mark A. Israel, and Andres V. Lerner, "Sprint's Proposed Weighted Spectrum Screen Defies Economic Logic and Is Inconsistent with Established Facts," Federal Communications Commission, WT Docket No. 12-269, March 14, 2014.

Reply Declaration of Mark A. Israel, "Competitive Effects and Consumer Benefits from the Proposed Acquisition of Leap Wireless by AT&T: A Reply Declaration," Federal Communications Commission, WT Docket No. 13-193, October 23, 2013.

Declaration of Mark A. Israel, "An Economic Analysis of Competitive Effects and Consumer Benefits from the Proposed Acquisition of Leap Wireless by AT&T," Federal Communications Commission, WT Docket No. 13-193, August 1, 2013.

Supplemental Reply Declaration of Michael L. Katz, Philip A. Haile, Mark A. Israel, and Andres V. Lerner, "Comments on Appropriate Spectrum Aggregation Policy with Application to the Upcoming 600 MHz Auction," Federal Communications Commission, WT Docket No. 12-269, June 13, 2013.

Reply Declaration of Michael L. Katz, Philip A. Haile, Mark A. Israel, and Andres V. Lerner, "Comment on the Submission of the U.S. Department of Justice Regarding Auction Participation Restrictions," Federal Communications Commission, WT Docket No. 12-269, June 13, 2013.

Reply Declaration of Michael L. Katz, Philip A. Haile, Mark A. Israel, and Andres V. Lerner, "Spectrum Aggregation Policy, Spectrum-Holdings-Based Bidding Credits, and Unlicensed Spectrum," Federal Communications Commission, GN Docket No. 12-268, March 12, 2013.

Declaration of Igal Hendel and Mark A. Israel, "Econometric Principles That Should Guide the Commission's Analysis of Competition for Special Access Service," Federal Communications Commission, WC Docket No. 05-25, February 11, 2013.

Reply Declaration of Mark A. Israel and Michael L. Katz, "Economic Analysis of Public Policy Regarding Mobile Spectrum Holdings," Federal Communications Commission, WT Docket No. 12-269, January 7, 2013.

Declaration of Mark A. Israel and Michael L. Katz, "Economic Analysis of Public Policy Regarding Mobile Spectrum Holdings," Federal Communications Commission, WT Docket No. 12-269, November 28, 2012.

Declaration of Mark Israel, "An Economic Assessment of the Prohibition on Exclusive Contracts for Satellite-Delivered, Cable-Affiliated Networks," Federal Communications Commission, MB Docket Nos. 12-68, 07-18, & 05-192, September 6, 2012.

Expert Report of Mark Israel, "Implications of the Verizon Wireless & SpectrumCo/Cox Commercial Agreements for Backhaul and Wi-Fi Services Competition," Federal Communications Commission, WT Docket No. 12-4, August 1, 2012.

Expert Report of Mark A. Israel, Michael L. Katz, and Allan L. Shampine, "Promoting Interoperability in the 700 MHz Commercial Spectrum," Federal Communications Commission, WT Docket No. 12-69, July 16, 2012.

Affidavits of Dr. Mark A. Israel in Re: Bloomberg L.P. V. Comcast Cable Communications, LLC, Federal Communications Commission, MB Docket No. 11-104, June 21, 2012 (Declaration), June 8, 2012 (Declaration), September 27, 2011 (Supplemental Declaration), July 27, 2011 (Declaration).

Expert Report of Robert Willig, Mark Israel, Bryan Keating, and Jonathan Orszag, "Response to Supplementary Comments of Hubert Horan," Docket DOT-OST-2009-1055, October 22, 2010.

Expert Report of Robert Willig, Mark Israel, Bryan Keating, and Jonathan Orszag, "Measuring Consumer Benefits from Antitrust Immunity for Delta Air Lines and Virgin Blue Carriers," Docket DOT-OST-2009-1055, October 13, 2010.

Expert Report of Mark Israel and Michael L. Katz, "Economic Analysis of the Proposed Comcast-NBCU-GE Transaction," Federal Communications Commission, MB Docket No. 10-56, July 20, 2010.

Expert Report of Mark Israel and Michael L. Katz, "The Comcast/NBCU Transaction and Online Video Distribution," Federal Communications Commission, MB Docket No. 10-56, May 4, 2010.

Expert Report of Mark Israel and Michael L. Katz, "Application of the Commission Staff Model of Vertical Foreclosure to the Proposed Comcast-NBCU Transaction," Federal Communications Commission, MB Docket No. 10-56, February 26, 2010.

Expert Report of Robert Willig, Mark Israel, and Bryan Keating, "Competitive Effects of Airline Antitrust Immunity: Response of Robert Willig, Mark Israel, and Bryan Keating" in Docket DOT-OST-2008-0252, January 11, 2010.

Affidavit of Dr. Mark A. Israel on Class Certification in Re: Puerto Rican Cabotage Antitrust Litigation, in the United States District Court for the District of Puerto Rico, MDL Docket No. 3:08-md-1960 (DRD), December 10, 2009.

Expert Report of Robert Willig, Mark Israel, and Bryan Keating, "Competitive Effects of Airline Antitrust Immunity" in Docket DOT-OST-2008-0252, September 8, 2009.

Expert Report and Supplemental Expert Report of Dennis W. Carlton and Mark Israel in Re: Toys "R" Us-Delaware, Inc., and Geoffrey Inc. v. Chase Bank USA N.A. in American Arbitration Association New York, New York, Commercial Arbitrations No. 13-148-02432-08, February 27, 2009 (Expert Report), March 20, 2009 (Supplemental Expert Report).

Expert Reports of James Levinsohn and Mark Israel in Re: 2006 NPM Adjustment Proceeding pursuant to Master Settlement Agreement, October 6, 2008 (Expert Report), January 16, 2009 (Expert Report), March 10, 2009 (Expert Report).

EXPERT WORK IN REVIEW OF MERGERS/TRANSACTIONS

Successful merger of ASE Group and SPIL. 2017. Lead economic expert on behalf of ASE Group. Submitted reports and testified to the Taiwan Fair Trade Commission, which ultimately cleared the transaction, then made multiple presentations to U.S. FTC, which also cleared the transaction. Economic analyses focused on implications of profit margins for market definition and competitive effects, ultimately demonstrating that the transaction was unlikely to cause significant harm to competition.

Successful acquisition of Alarm.com of two business units (Connect and Piper) from iControl Networks. 2017. Led team that demonstrated substantial and growing competition in home security and connected home marketplace and thus lack of competitive harm from acquisition. Work focused on importance of downstream market definition as well as empirical evidence of impact of competition on Alarm.com pricing and profitability.

Successful acquisition of Samsung Electronics, Ltd.'s printer business by HP Inc. 2016. Led team in evaluating the competitive effects of the acquisition, including assessing shares and competitive effects in overlap areas. Notably, the transaction gained regulatory approval in the U.S. during the initial review period without issuing a Second Request.

Successful acquisition of Sun Products Corp. by Henkel AG. 2016. Led team demonstrating lack of competitive impact despite overlaps in laundry detergent and related products.

Successful acquisition of Starwood Hotels & Resorts by Marriott International. 2016. Led team that performed detailed analysis of competitive conditions, extensive econometric analysis of pricing, and full review of Marriott's internal pricing models to demonstrate that Starwood and Marriott were not close competitors, combined ownership of the brands would not lead to upward pricing pressure, and competition would remain robust post-merger.

Successful acquisition of PR Newswire by GTCR. 2016. Lead economic expert for GTCR. Made presentations to DOJ showing lack of competitive harm from the transaction, based on detailed analysis of win/loss data, including calculations showing no possible upward pricing pressure (UPP) concerns regardless of the level of margins.

Successful acquisition of Schurz Communications' Broadcast Stations by Gray Television. 2015. Lead economic expert for Gray. Made presentations to DOJ demonstrating output expanding effects of proposed transaction in light of the scale economies in television production and advertising and the small size of the DMAs affected by the transaction.

Successful acquisition of the Communications Business of Danaher Corporation by NetScout Systems. 2015. Lead economic expert for NetScout. Made presentations to DOJ describing proper economic framework for analysis of competition and potential merger harms, and demonstrated that the presence of multiple viable competitors and numerous other credible threats to be used by powerful buyers in a dynamic industry made theories of anti-competitive harm from the merger implausible.

Successful acquisition of Windmill Distribution Co. by Manhattan Beer Distributors. 2015. Lead economic expert for Manhattan Beer Distributors. Submitted White Paper to DOJ demonstrating, based on margin data, that the merger would be highly unlikely to lead to anti-competitive effects. Transaction was granted early termination from the Hart Scott Rodino process by the DOJ.

Proposed acquisition of Time Warner Cable by Comcast Corporation. 2014-2015. Served as lead economic expert on broadband issues on behalf of Comcast Corporation. Submitted multiple Declarations and made multiple presentations to DOJ and FCC, explaining lack of horizontal, bargaining, or vertical/foreclosure concerns with regard to broadband competition as a result of the transaction.

Successful acquisition of Leap Wireless by AT&T. 2014. Lead economic expert for AT&T. Submitted multiple Declarations to FCC and made presentation to DOJ, demonstrating the transaction would generate substantial consumer benefits, while generating at most minimal upward pricing pressure in a properly defined mobile wireless services market and no issues related to spectrum concentration or other competitive concerns.

Successful merger of American Airline and US Airways. 2013. Lead consulting expert, managing Compass Lexecon team of over 25 economists supporting multiple experts. Made multiple presentations to DOJ, worked on expert reports in litigation, and assisted counsel with the analysis leading to settlement of litigation, permitting transaction to close.

Successful merger of T-Mobile USA and MetroPCS. 2013. Lead economic expert for T-Mobile USA. Conducted economic analyses of competitive effects of the transaction, as well as consumer benefits from reduced costs and increased network quality. Presented analyses to both DOJ and FCC.

FTC investigation of acquisition of Dollar Thrifty Automotive Group by Hertz. 2012. Served as a lead economic expert for FTC and prepared to serve as FTC's testifying expert against the merger, prior to case settlement. Conducted empirical analyses based on previous rental car mergers demonstrating likely price increases from the transaction.

Decision by Federal Communications Commission not to extend the ban on exclusive contracts for satellite-delivered, cable-affiliated networks. 2012. Lead economic expert for National Cable and Telecommunications Association. Submitted economic analysis demonstrating that the ban on exclusive distribution of satellite-delivered, cable affiliated networks is no longer warranted given increased marketplace competition. FCC made decision to allow the ban to sunset.

Successful sale of wireless spectrum by SpectrumCo and Cox ("Cable Companies") to Verizon Wireless and successful completion of related commercial agreements. 2012. On behalf of the Cable Companies, performed economic analyses demonstrating lack of competitive harm from the transaction on markets for backhaul and Wi-Fi services. Presented analyses to FCC.

Successful acquisition by LIN Media of broadcast television stations from NVTV. 2012. Lead economic expert for LIN Media. Prepared economic analysis demonstrating lack of competitive concern over potential issues related to Shared Service and Joint Sale Arrangements.

Proposed acquisition of T-Mobile USA by AT&T. 2011. Served as one of the lead economists, initially for T-Mobile (along with Michael Katz) and ultimately for both parties (along with Michael Katz and Dennis Carlton). Made multiple presentations to DOJ and FCC. Appeared in FCC Workshop, ex parte meeting.

S*uccessful application for antitrust immunity by Delta and Virgin Blue*. 2010. Together with Robert Willig, Bryan Keating, and Jon Orszag, prepared economic analyses demonstrating substantial net consumer benefits from antitrust immunity. Submitted results in expert reports to Department of Transportation.

Successful joint venture between Comcast and NBC Universal (and ultimate full acquisition of NBC Universal by Comcast). 2010. Served as one of the lead economists (along with Michael Katz) on behalf of the merging parties. Wrote multiple reports submitted to FCC (with Michael Katz) demonstrating lack of significant competitive concerns from the transaction. Made multiple presentations to DOJ and FCC. Appeared in FCC Workshop of economists, ex parte meeting.

Successful application for antitrust immunity for oneworld alliance and associated joint venture of American Airlines, British Airways, and Iberia Airlines. 2009-2010. Together with Robert Willig and Bryan Keating, prepared economic analyses demonstrating substantial net consumer benefits associated with antitrust immunity for the joint venture. Submitted results in expert reports to Department of Transportation.

Successful acquisition by PepsiCo of bottlers, PBG and PAS. 2009. Performed econometric and simulation analyses demonstrating pro-competitive effect of merger on PepsiCo's own brands, other brands distributed by PBG and PAS, and overall marketplace. Presented results to FTC (together with Dennis Carlton).

Successful merger of Delta Airlines and Northwest Airlines. 2008. In support of Dennis Carlton, developed empirical and theoretical analyses to demonstrate merger's pro-competitive nature. Work focused on (ultimately settled) private litigation opposing the merger.

Successful acquisition of Harcourt Education by Houghton Mifflin. 2007. Along with Daniel Rubinfeld and Frederick Flyer, developed econometric analyses demonstrating lack of competitive harm from proposed merger. Presented results to DOJ.

Successful acquisition of Chicago Board of Trade by Chicago Mercantile Exchange. 2007. Along with Robert Willig and Hal Sider, developed and presented multiple empirical analyses demonstrating lack of competitive harm from merger. Submitted multiple white papers and made multiple presentations to DOJ.

SELECTED OTHER EXPERT/CONSULTING WORK

Led team supporting Dennis Carlton's testimony in Toshiba/Hannstar TFT-LCD Antitrust litigation vs. Plaintiff Best Buy, 2013.

Led team supporting Dennis Carlton's testimony in Toshiba's TFT-LCD Class Action Antitrust litigation. Named Litigation Matter of the Year for 2012 by *Global Competition Review*, 2012.

As economic expert for US Airways, developed econometric analysis of air traffic at major US airports, presented to Philadelphia Airport management team, 2011.

Prepared analysis of the competitive impact of low-cost-carrier competition in Washington, DC and New York airports. Filed with DOT, 2011.

On behalf of major pharmaceutical firm, developed econometric model to forecast pharmaceutical expenditures, 2009.

Developed econometric model to measure of the importance of network effects in credit cards in the context of measuring damages incurred by a major credit card issuer, 2007-2008.

PUBLICATIONS

"Competitive Effects of International Airline Cooperation," (with Robert J. Calzaretta and Yair Eilat), forthcoming in the *Journal of Competition Law and Economics*, September 2017.

"Econometrics and Regression Analyses," (with Chris Cavanagh, Paul Denis, and Bryan Keating), Chapter forthcoming in *Proving Antitrust Damages*, 2017.

"Complementarity without Superadditivity," (with Steven Berry, Philip Haile, and Michael Katz), Volume 151, Pages 28-30 in *Economics Letters*, February 2017.

"Antitrust in a Mobile World," (with Yonatan Even, Jonathan M. Jacobson, Scott Martin, and Dr. Helen Weeds), Chapter 17 of *International Antitrust Law & Policy: Fordham Competition Law 2015*, Edited by James Keyte, Juris Publishing, Inc., 2016.

"Buyer Power in Merger Review," (with Dennis W. Carlton and Mary Coleman), Chapter 22 of *The Oxford Handbook of International Antitrust Economics*, Volume 1, Roger D. Blair and D. Daniel Sokol, eds, Oxford University Press, 2015.

"The Evolution of Internet Interconnection from Hierarchy to 'Mesh': Implications for Government Regulation," (with Stanley M. Besen), *Information Economics and Policy*, December 2013.

"Airline Network Effects and Consumer Welfare," (with Bryan Keating, Dan Rubinfeld, and Robert Willig), *Review of Network Economics*, November 2013.

"The Delta-Northwest Merger: Consumer Benefits from Airline Network Effects (2008)," (with Bryan Keating, Daniel L. Rubinfeld, and Robert D. Willig), *The Antitrust Revolution*, Sixth Edition, Edited by John E. Kwoka, Jr. and Lawrence J. White, Oxford University Press, New York, July 2013.

"Proper Treatment of Buyer Power in Merger Review," (with Dennis W. Carlton), *Review of Industrial Organization*, July 2011.

"Response to Gopal Das Varma's Market Definition, Upward Pricing Pressure, and the Role of the Courts: A Response to Carlton and Israel," (with Dennis W. Carlton), *The Antitrust Source*, December 2010.

"Will the New Guidelines Clarify or Obscure Antitrust Policy?" (with Dennis W. Carlton), *The Antitrust Source,* October 2010.

"Should Competition Policy Prohibit Price Discrimination?" (with Dennis W. Carlton), *Global Competition Review*, 2009.

"The Empirical Effects of Collegiate Athletics: An Update Based on 2004-2007 Data," (with Jonathan Orszag), Paper commissioned by National Collegiate Athletic Association, available *at* *http://www.epi.soe.vt.edu/perspectives/policy_news/pdf/NCAASpending.pdf*, February 2009.

"Services as Experience Goods: An Empirical Examination of Consumer Learning in Automobile Insurance," *The American Economic Review*, December 2005.

"Tenure Dependence in Consumer-Firm Relationships: An Empirical Analysis of Consumer Departures from Automobile Insurance Firms," *The Rand Journal of Economics*, Spring 2005.

"The Impact of Youth Characteristics and Experiences on Transitions Out of Poverty," (with Michael Seeborg), *The Journal of Socio-Economics*, 1998.

"Racial Differences in Adult Labor Force Transition Trends," (with Michael Seeborg), *The Journal of Economics*, 1994.

WORKING PAPERS AND RESEARCH IN PROGRESS

"Do Premiums Increase After Health Insurance Mergers? – A Reassessment of Guardado et al.'s Findings," (with Robert C. Bourke, Ben Wagner, and David A. Weiskopf), available at *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2933062*, March 2017.

"Are You Pushing Too Hard? Lower Negotiated Input Prices as a Merger Efficiency: The Anthem-Cigna Merger," (with Erica Benton, Loren Smith, Thomas Stemwedel, and Ka Hei Tse), February 2017.

"Are Legacy Airline Mergers Pro- or Anti-Competitive? Evidence from Recent U.S. Airline Mergers," (with Dennis Carlton, Ian MacSwain, and Eugene Orlov), available at *https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2851954*, October 2016.

SELECTED RECENT PRESENTATIONS

J.P. Morgan Special Situations Investor Forum, "The Antitrust Merger Review Process," Panelist, March 2017.

American Bar Association Section of Antitrust Law, "Economic Issues Raised In The Comcast – Time Warner Cable Merger," Panelist, February 2016.

Fordham Competition Law Institute, 42nd Annual Conference on International Antitrust Law and Policy, Panel: Antitrust in a Mobile World, Panelist, October 2015.

American Bar Association Section of Antitrust Law, "Merger Practice Workshop," Faculty Member, October 2015.

Searle Center Conference on Antitrust Economics and Competition Policy, Panel on Recent Transactions in the Telecom Industry, Panelist, September 2015.

National Bureau of Economic Research, Summer Institute 2015, Industrial Organization Meetings, "Panel Discussion of the Comcast-Time Warner Merger," Panelist, July 2015.

Federal Communications Bar Association, "How the Antitrust Agencies and the FCC are Likely to Analyze Vertical Mergers," Panelist, November 2014.

The Coca Cola Company Global Antitrust Forum, "Round Table Discussion on Use of Economics and Economists," Panel Chair, November 2014.

Compass Lexecon Competition Policy Forum, Lake Como Italy, "Consolidation of the Telecoms Industry in the EU and the US," Panelist, October 2014.

The IATA Legal Symposium 2014, Aviation Law: Upfront and Center, "Merger Analysis – A sudden shift in approach by DOJ in the American Airlines and US Airways merger," Panelist, February 2014.

Georgetown Law 7th Annual Global Antitrust Enforcement Symposium, "Merger Enforcement and Policy," Panelist, September 2013.

American Bar Association Section of Antitrust Law, "Airline Mergers: First Class Results or Middle-Seat Misery?" Panelist, May 2013.

American Bar Association Section of Antitrust Law, "Go Low or Go Home! Monopsony a Problem?" Panelist, March 2012.

Federal Communications Bar Association Transactional Committee CLE Seminar, "The FCC's Approach to Analyzing Vertical Mergers," Panelist, October 2011.

The Technology Policy Institute Aspen Forum, "Watching the Future: The Economic Implications of Online Video," Panelist, August 2011.

American Bar Association Forum on Air & Space Law, 2011 Update Conference, "Antitrust Issues: What's on the Horizon for the Industry," Panelist, February 2011.

American Bar Association Section of Antitrust Law, "Antitrust in the Airline Industry," Panelist, September 2010.

GRANTS AND HONORS

Searle Fund for Policy Research Grant, 2004-2006, for "An Empirical Examination of Asymmetric Information in Insurance Markets."

Kellogg School of Management Chairs' Core Course Teaching Award, 2003 & 2005.

Bradley Dissertation Fellowship, Stanford University, 1999-2000.

Stanford University, Outstanding Second Year Paper Prize, 1997.

SELECTED ACADEMIC SEMINARS

Yale University
University of Arizona
Washington University, St. Louis
University of Pennsylvania
University of Toronto
UCLA
University of Wisconsin-Madison
Massachusetts Institute of Technology
Harvard University
University of Chicago
Columbia University
University of Texas
Carnegie Mellon University
University of California, Irvine
University of California, San Diego

REFEREE FOR ACADEMIC JOURNALS

American Economic Review
The Journal of Industrial Economics
The Rand Journal of Economics
Journal of the European Economic Association
The Review of Economic Studies
The Review of Economics and Statistics
Journal of Risk and Insurance

Appendix B

ALLAN SHAMPINE **July 2017**

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EDUCATION

Ph.D. UNIVERSITY OF CHICAGO: Economics, 1996
(Full scholarship from the University)
(Thesis: *An Evaluation of Technology Diffusion Models and Their Implications*)
(Field specializations: urban economics, agricultural economics)

M.A. UNIVERSITY OF CHICAGO: Economics, 1993
(Full scholarship from the University)

B.S. SOUTHERN METHODIST UNIVERSITY: Economics and Systems Analysis, Mathematics Minor, 1991
(Full scholarship from the University)
(Summa Cum Laude, Honors, Departmental Distinction)

PROFESSIONAL EXPERIENCE

Compass Lexecon (formerly Lexecon), Chicago, Illinois: (1996 – date)

Editor for *The Antitrust Source*, American Bar Association (2011 – Present)

PUBLICATIONS

BOOKS

Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies, (Editor) Nova Science Press (2003).
(Contributors include Debra Aron, Johannes Bauer, Peter Bernstein, David Burnstein, Robert Crandall, Nicholas Economides, Wayne Fu, Shane Greenstein, Charles Jackson, Junghyun Kim, Donald Kridel, Mercedes Lizardo, Paul Rappoport, Pablo Spiller, Lester Taylor and Steven Wildman)

ARTICLES

"Economics of Patents and Standardization: Network Effects, Hold-Up, Hold-Out, Stacking," with Timothy Simcoe, forthcoming in *The Cambridge Handbook of Technical Standardization Law*.

Contributor to American Bar Association *Telecom Antitrust Handbook* (2017 edition), forthcoming.

"FRAND and the Smallest Saleable Unit," with Joseph Kattan & Janusz Ordover, *CPI Chronicles*, September 2016.

"Applying the Non-Discrimination Requirement of FRAND When Rates Change," *Antitrust Source*, American Bar Association, August 2016.

"Patent Litigation, Standard Setting Organizations, Antitrust and FRAND" with Dennis Carlton, 22 *Texas Intellectual Property Law Journal* 3 (2014).

"Implementing the FRAND Commitment" with Janusz Ordover, *Antitrust Source*, American Bar Association, October 2014.

"Identifying Benchmarks for Applying Non-Discrimination in FRAND" with Dennis Carlton, *CPI Antitrust Chronicle*, August 2014.

Review of "Strategic Patent Acquisitions" (by Fiona Scott Morton & Carl Shapiro), *Antitrust Source*, American Bar Association, October 2013.

"An Economic Interpretation of FRAND" with Dennis Carlton, 9 *Journal of Competition Law and Economics* 3, 2013.

"The Role of Behavioral Economics in Antitrust Analysis," 27 *Antitrust* 2, American Bar Association, Spring 2013.

"Testing Interchange Fee Models Using the Australian Experience," proceedings of the Bank of Canada Economics of Payments VI conference, May 24, 2012.

Review of "Why (Ever) Define Markets? An Answer to Professor Kaplow," (by Gregory Werden), *Antitrust Source*, American Bar Association, April 2012.

Review of "An Empirical Study of the Effects of *Ex Ante* Licensing Disclosure Policies on the Development of Voluntary Technical Standards," (by Jorge Contreras), *Antitrust Source*, American Bar Association, February 2012.

"Price Indexes, Hedonic Analysis and Patent Damages," 5 *Journal of Intellectual Property Law & Practice* 2 (2010).

"Credit Cards in Context: Framing the Discussion" and "Assessing the Social Effects of the Use of Credit Cards" in The Law and Economics of Interchange Fees and Credit Card Markets, International Center for Law & Economics, December 8-9, 2009.

"Reasonable royalties and the sale of patent rights," 4 *Journal of Intellectual Property Law & Practice* 8 (2009).

"The Evaluation of Social Welfare for Payment Methods," *2009 Oxford Business & Economics Conference Proceedings*, June 2009.

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"The Impact of Technology on the Modern Labor Market," 11 *Southwestern Journal of Economic Abstracts* 1 (1990).

RESEARCH PAPERS

"Identifying Benchmarks for Applying Non-Discrimination in FRAND" with Dennis Carlton (2014 - SSRN)

"An Economic Interpretation of FRAND" with Dennis Carlton (2013 – SSRN)

"An Evaluation of the Social Costs of Payment Methods Literature" (2012 – SSRN)

"A New Direction in Mixed Income Housing," submitted to Chicago Housing Authority (1993).

"A Survey of the Economics of Information, Focusing on Water" (1992).

"Petroleum Price Shocks and Rationality," B.S. Honors Paper (1991).

OTHER PROFESSIONAL EXPERIENCE

Panelist at American University, Washington College of Law's Patent Pledges: Developing a Research Agenda conference, May 30, 2014.

Panelist at Texas Intellectual Property Law Journal's 15th Annual Intellectual Property Symposium, FRAND and the Antitrust / Intellectual Property Interface, February 21, 2014.

Panelist at Georgetown University Law Center's Hotel & Lodging Legal Summits, "Navigating Antitrust Issues Arising from the Online Distribution World" (October 24-25, 2013).

"An Economic Interpretation of FRAND" paper with Dennis Carlton, presented by Carlton at the Heath Lecture & Workshop on FRAND, University of Florida Law Advocacy Center (September 2013).

Interviewed by *IEEE Spectrum* for "The High Cost of Taking Your Money" (June 2012).

"Testing Interchange Fee Models Using the Australian Experience," presented as part of a special session "Interchange Fees: Regulation and Implications" at Economics of Payments VI conference, Bank of Canada, May 24, 2012.

Interviewed by *The Oregonian* for "Those credit card rewards cost us a lot of cash" (July 31, 2010).

Participant in "The Law and Economics of Interchange Fees and Credit Card Markets" symposium sponsored by International Center for Law & Economics (December 8-9, 2009).

"The Evaluation of Social Welfare for Payment Methods," 2009 Oxford Business & Economics Conference (June 24-26, 2009).

Interviewed by *Cards Insider* for "Payments: Cash Replacement, Anonymity provides lifeline for cash over cards" (January 28, 2008).

"Boom and Bust in Network Industries: Rising from the Ashes," 6th Global Conference on Business & Economics, Harvard University (October 15-17, 2006), with Hal S. Sider.

"House of Cards: The Economics of Interchange Fees," Presentation to the Federal Reserve Bank of New York Conference, *Antitrust Activity in Card-Based Payment Systems: Causes and Consequences* (September 16, 2005), with Alan S. Frankel.

"The Impact of Technology on the Modern Labor Market," 68th Annual Meeting of the Southwestern Social Science Association (March 29, 1990)

Presented papers on information externalities and technology diffusion at the *Economics and Public Policy Workshop* (3) and *Price Theory Workshop* (1), University of Chicago (1995, 1996)

Coordinated the *Conference on Valuing Non-Market Goods*, University of Chicago (July 21-22, 1995)

Assisted in coordinating the *Conference on Research in Health Economics*, University of Chicago (October 21-22, 1994)

Assisted in organizing the *Economic Policy and Public Finance Workshop*, University of Chicago (1993 - 1996)

Member of the *American Economics Association*

Associate member of the *American Bar Association*

Referee for the *Agricultural and Resource Economics Review, American Journal of Agricultural Economics, Antitrust Law Journal, Journal of Business* and *Journal of Evolutionary Economics*.

TESTIMONY AND REPORTS

Declaration, Before the Federal Communications Commission, WC Docket No. 17-108, Restoring Internet Freedom Proceeding, July 17, 2017 (with Mark Israel and Thomas Stemwedel).

Rebuttal Expert Witness Statement, Before the American Arbitration Commission, Case No. 02-14-0002-2511, May 24, 2016.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Snap-On, Inc. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-01242, April 18, 2016. Deposition (May 25, 2016 IPR2015-01164 deposition entered into record).

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Snap-On, Inc. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-01243, April 18, 2016.

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Expert Witness Statement, Before the American Arbitration Commission, Case No. 02-14-0002-2511, April 15, 2016.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Hilti, Inc. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-01164, April 5, 2016. Deposition, May 25, 2016 (joint deposition for 1164, 1165 and 1166 cases).

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Hilti, Inc. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-01165, April 5, 2016.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Hilti, Inc. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-01166, April 5, 2016.

Expert Report, Before the Australian Competition & Consumer Commission, national broadband network special access undertaking variation, March 24, 2016 (With Janusz Ordover)

Declaration, Before the Federal Communications Commission, WC Docket No. 15-247, Special Access Proceeding, January 7, 2016 (with Dennis Carlton, Mark Israel and Hal Sider).

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00595, November 23, 2015. Deposition, February 10, 2016 (joint deposition for 595, 596 and 597 cases).

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00596, November 23, 2015.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00597, November 23, 2015.

Comments, Before the Info-Communications Development Authority of Singapore, August 25, 2015 (with Janusz Ordover).

Trial Testimony, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, January 28, 2015.

Rebuttal Witness Statement, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, December 12, 2014.

Direct Testimony, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, November 20, 2014. Amended Direct Testimony, November 25, 2014.

Reply Expert Report, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, October 3, 2014. Deposition, October 22, 2014.

Expert Report, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, September 12, 2014.

Supplemental Declaration, Before the Federal Communications Commission, MB Docket No. 10-71, Programming Exclusivity Rules, July 24, 2014 (with Mark Israel).

Report, Before the Korea Fair Trade Commission, Case No. 2014GiGuel1474 Regarding Microsoft Corporation and Nokia Corporation's Merger, July 21, 2014 (with Dennis Carlton).

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Whitepaper on Patent Licenses Negotiated Subject to Judicial Review, submitted to the Chinese NDRC on behalf of Qualcomm, May 16, 2014 (with Dennis Carlton).

Declaration Commenting on Commitments Offered by Google to Address Competition Concerns, Case COMP/C-3/39.740 – Foundem and others, July 1, 2013 (with Janusz Ordover).

Reply Declaration in the Matter of Special Access for Price Cap Local Exchange Carriers, Before the Federal Communications Commission, WT Docket No. 05-25, March 12, 2013 (with Dennis Carlton).

Supplemental Declaration before the Federal Maritime Commission, Docket No. 11-12, Hanjin Shipping Co., Ltd. et al., v. the Port Authority of New York and New Jersey, January 31, 2013 (with Fredrick Flyer).

Reply Declaration in the Matter of Policies Regarding Mobile Spectrum Holdings, Before the Federal Communications Commission, WT Docket No. 12-269, January 3, 2013.

Declaration in the Matter of Policies Regarding Mobile Spectrum Holdings, Before the Federal Communications Commission, WT Docket No. 12-269, November 26, 2012.

Expert Report to the Australian Competition & Consumer Commission with regards to the regulatory treatment of the National Broadband Network, September 24, 2012 (with Janusz Ordover).

Report in the Matter of Promoting Interoperability in the 700 MHz Commercial Spectrum, Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the 700 MHz Band, Before the Federal Communications Commission, WT Docket No. 12-69, July 16, 2012 (with Mark Israel and Michael Katz).

Declaration in the Matter of Joseph I. Marchese on Request for Inspection of Records, Comments of Deutsche Telekom AG and T-Mobile USA, Inc., FCC FOIA Control No. 2012-12, filed November 14, 2011.

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Declaration, In Re Bursor & Fisher, P.A., v. Federal Communications Commission, Case No. 1:11-cv-05457-LAK, U.S. District Court, SDNY, August 26, 2011.

Reply Declaration, in Re: the Merger of AT&T with T-Mobile: Before the Federal Communications Commission, WT Docket No. 11-65, June 9, 2011 (with Dennis Carlton and Hal Sider).

Declaration, In Re: the Merger of AT&T with T-Mobile: Before the Federal Communications Commission, WT Docket No. 11-65, April 20, 2011 (with Dennis Carlton and Hal Sider).

Declaration, In Re Payment Card Interchange Fee and Merchant Discount Antitrust Litigation (Master File No. 1:05-MD-1720-JG-JO), February 10, 2011.

Declaration on behalf of the Port Authority of New York & New Jersey re CFC recovery fee, December 9, 2010 (with Fredrick Flyer).

Supplemental Declaration to the Federal Communications Commission, in the Matter of Implementation of Section 224 of the Act; A National Broadband Plan for Our Future (WC Docket No. 07-245), November 2, 2010 (with Jonathan Orszag).

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Declaration, In Re Gabapentin Patent Litigation (MDL No. 1384, Master Docket No. 00-CV-2931 (FSH)), March 29, 2010.

Reply Declaration to the Federal Communications Commission, In the Matter of Special Access Rates for Price Cap Local Exchange Carriers (WC Docket No. 05-25), February 24, 2010 (with Dennis Carlton and Hal Sider).

Reply Declaration to the Federal Communications Commission, Verizon Wireless / ALLTEL transaction (WT Docket No. 08-95), August 19, 2008 (with Dennis Carlton and Hal Sider).

Declaration to the Federal Communications Commission, Verizon Wireless / ALLTEL transaction (WT Docket No. 08-95), June 13, 2008 (with Dennis Carlton and Hal Sider).

Ex parte filing before the Federal Communications Commission on behalf of Verizon, "Verizon/MCI Merger: Analysis of Special Access," September 9, 2005 (with Gustavo Bamberger and Dennis Carlton).

Comments to the New York Public Service Commission, In the Matter of the Joint Petition of Verizon Communications, Inc. and MCI, Inc. for a Declaratory Ruling Disclaiming Jurisdiction Over or, in the Alternative, for Approval of Agreement and Plan of Merger; and Joint Petition of SBC Communications Inc., AT&T Corporation, Together with its Certificated New York Subsidiaries, for Approval of Merger (CASE 05-C-0237 and CASE 05-C-0242), August 5, 2005 (with Gustavo Bamberger and Dennis Carlton).

Reply Declaration to the Federal Communications Commission, In the Matter of Verizon Communications Inc. and MCI, Inc., Application for Approval of Transfer of Control (WC Docket No. 05-75), May 24, 2005 (with Gustavo Bamberger and Dennis Carlton).

Declaration to the Federal Communications Commission, In the Matter of Verizon Communications Inc. and MCI, Inc., Application for Approval of Transfer of Control (WC Docket No. 05-75), March 9, 2005 (with Gustavo Bamberger and Dennis Carlton).

Reply Declaration to the Federal Communications Commission, In the Matter of Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements (WC Docket No. 02-112) and 2000 Biennial Regulatory Review of Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules (CC Docket 00-175), July 28, 2003 (with Dennis Carlton and Hal Sider).

Declaration to the Federal Communications Commission, In the Matter of Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements (WC Docket No. 02-112) and 2000 Biennial Regulatory Review of Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules (CC Docket 00-175), June 30, 2003 (with Dennis Carlton and Hal Sider).

Reply Declaration to the Federal Communications Commission in the Matter of 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, May 14, 2001 (with Robert Gertner).

Declaration to the Federal Communications Commission in the Matter of 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, Docket No. 01-14, April 13, 2001 (with Robert Gertner).

Report to Directorate General IV of the European Commission: "Remedies in the United States," in *Remedies in the United States*, in *Remedies in EU Competition Law: The Policy and Practice of the European Commission, A Report for Directorate General IV of the European Commission*, July 1998, Report (with James Langenfeld).

ACADEMIC HONORS

Undergraduate:

Graduated Summa Cum Laude, Honors, Departmental Distinction
Award for Excellence (given to the outstanding senior in the Economics Department as decided by the vote of the faculty)
Presidential Scholarship (full scholarship)
National Merit Scholar (honorary)
Hyer Society (honorary society of Southern Methodist University)
Honor Roll (1987-1991)
Phi Beta Kappa
Alpha Lambda Delta (Treasurer, honorary society recognizing academic achievement)
Phi Eta Sigma (honorary society recognizing academic achievement)
Omicron Delta Epsilon (international honor society in economics)
Kappa Mu Epsilon (honor society in mathematics)

Graduate:
Full Scholarship (tuition and stipend)

Appendix C

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FIELDS OF SPECIALIZATION

Applied Econometrics
Class Certification
Damages
Financial Services
Industrial Organization
Telecommunications

EDUCATION

M.A., UNIVERSITY OF CHICAGO, Chicago, Illinois: Irving B. Harris Graduate School of Public Policy, (with honors), 1994.

B.A., UNIVERSITY OF CHICAGO, Chicago, Illinois: Public Policy Studies, 1991. Completed requirements for B.A. in Economics.

PUBLICATIONS

"Econometric Analysis of Telephone Mergers" (with Dennis Carlton and Hal Sider), pp. 373-395 in American Bar Association, Econometrics: Legal, Practical and Technical Issues, (2005).

TESTIMONY

Expert Report of Thomas A. Stemwedel Regarding the Effects of the Anthem-Cigna Merger on Georgia Consumers, submitted to the Georgia Department of Insurance and Safety Fire Commissioner, February 1, 2017.

Declaration of Thomas A. Stemwedel, *In Re: Polyurethane Foam Antitrust Litigation*, United States District for the Northern District of Ohio, Western Division, MDL Docket No. 2196, Index No. 10-MD-2196 (JZ), March 7, 2014.

Certification of Thomas A. Stemwedel, in *Frank K. Cooper Real Estate #1, Inc., et al vs. Cendant Corporation f/k/a Hospitality Franchise Systems and Century 21 Real Estate Corporation*, Superior Court of New Jersey, Law Division: Morris County, Docket No. MRS-L-377-02, August 2, 2011.

PROFESSIONAL EXPERIENCE

Compass Lexecon (formerly Lexecon), Chicago, Illinois (August 1994-Present) 1995-2001: Economist; 2001-2013: Vice President; 2013-2015: Senior Vice President; 2015-Present: Executive Vice President.

PRINCIPAL CONSULTING ENGAGEMENTS

In Re: LIBOR-Based Financial Instruments Antitrust Litigation, United States District Court for the Southern District of New York, MDL No. 2262, Master File No. 1:11-md-2262 (NRB): Economic and econometric analysis of class certification issues, on behalf of defendants.

United States of America, et al. v. Anthem, Inc., et al., United States District Court for the District of Columbia, Civil Action No. 16-CV-1493: Economic and econometric analysis of efficiencies, monopsony, competitive effects and market definition, on behalf of Anthem.

In the Matter of GlaxoSmithKline plc, Before the Securities and Exchange Commission, File No. 3-17606: Economic and econometric analysis of improper gains from FCPA violations, on behalf of GlaxoSmithKline.

In Re: National Collegiate Athletic Association Athletic Grant-in-Aid Cap Antitrust Litigation, United States District Court for the Northern District of California, Oakland Division, Case No. 4:14-md-02541-cw: Economic analysis of class certification issues, on behalf of defendants.

Russell Dover et al. v. British Airways, PLC (UK), United States District Court for the Eastern District of New York, Case No. 1:12-cv-05567-MKB-MDG: Economic analysis of class certification, liability, damages issues, on behalf of plaintiffs.

In Re: Automotive Parts Antitrust Litigation, United States District Court for the Eastern District of Michigan, Southern Division, Case No. 2:12-md-02311: Economic and econometric analysis of damages from bid rigging of alternators and starter motors as a neutral expert on behalf of settling defendant and direct action plaintiff.

Amgen Inc. and Amgen Manufacturing, Limited v. Sandoz Inc., Sandoz International GMBH, and Sandoz GMBH, United States District Court for the Northern District of California, Case No. 3:14-cv-04741-RS: Economic analysis of injunctive relief and irreparable harm from violations of the BPCIA, on behalf of Amgen.

Kleen Products LLC et al. v. Packaging Corporation of America, et al., United States District Court for the Northern District of Illinois, Eastern Division, Case No. 1:10-cv-05711: Economic and econometric analysis of class certification issues, on behalf of defendants.

In Re: Cathode Ray Tube (CRT) Antitrust Litigation, United States District for the Northern District of California, San Francisco Division, MDL Docket No. 1917: Economic and econometric analysis pass-through and damages on behalf of defendants.

AT&T Inc.'s Acquisition of Leap Wireless International, Inc.: Economic analysis on behalf of AT&T and Leap before the FCC and Justice Department.

In Re: Polyurethane Foam Antitrust Litigation, United States District for the Northern District of Ohio, Western Division, MDL Docket No. 2196, Index No. 10-MD-2196 (JZ): Economic and econometric analysis of class certification issues, on behalf of defendants. Economic and econometric analysis of liability and damages issues on behalf of Future Foam, Inc.

The joint venture combining the indexing businesses of The McGraw-Hill Companies and CME Group Inc.: Economic and econometric analysis on behalf of CME and McGraw-Hill, before the Justice Department.

In re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010, MDL No. 2179: Economic analysis of various issues related to settlement of class claims, on behalf of BP.

AT&T Inc.'s Proposed Acquisition of T-Mobile USA.: Economic and econometric analysis on behalf of AT&T and T-Mobile before the FCC, Justice Department, and various state public utility commissions.

In re: Rail Freight Fuel Surcharge Antitrust Litigation, United States District Court for the District of Columbia, MDL Docket No. 1869, Misc. No. 07-489 (PLF): Economic and econometric analysis of class certification issues, on behalf of defendants. Economic and econometric analysis of liability and damage issues, on behalf of BNSF Railway Company.

CME Group Inc.'s Acquisition of Dow Jones Index Products: Economic and econometric analysis on behalf of CME, before the Justice Department.

In the Matter of Special Access Rates for Price Cap Local Exchange Carriers WC Docket No. 05-25 and AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services RM-10593, before the Federal Communications Commission: Economic analysis of appropriate standards for regulation of special access services, on behalf of AT&T.

Frank K. Cooper Real Estate #1, Inc., et al vs. Cendant Corporation f/k/a Hospitality Franchise Systems and Century 21 Real Estate Corporation, Superior Court of New Jersey, Law Division: Morris County, Docket No. MRS-L-377-02: Economic and econometric analysis of class certification, liability and damages issues, on behalf of defendants.

Maher Terminals, LLC v. The Port Authority of New York and New Jersey, Before the Federal Maritime Commission, Docket No. 08-03: Economic analysis of allegedly discriminatory terminal lease terms, on behalf of the Port Authority.

William D. Hoffman et al. v. American Express Travel Related Services, Inc. et al. Superior Court of the State of California in and for the County of Alameda, Case No. 2001-022881: Economic analysis of damages from contract and false advertising claims, on behalf of American Express.

Verizon Wireless's Acquisition of Alltel Corporation and Atlantis Holdings LLC.: Economic and econometric analysis on behalf of Verizon Wireless and Alltel, before the Justice Department and FCC.

CME Group Inc.'s Acquisition of NYMEX Holdings Inc.: Economic and econometric analysis on behalf of CME, before the Justice Department.

BHP Billiton's Proposed Acquisition of Rio Tinto: Economic and econometric analysis on behalf of BHP Billiton, before the Justice Department and various international competition authorities.

Ortho Biotech Products L.P. v. Amgen Inc. and Amgen USA Inc., in US District Court, District of New Jersey, 05-CV-4850-SRC-JJH: Economic and econometric analysis of damages in an alleged product tying arrangement and pricing scheme, on behalf of Amgen.

American Express Travel Related Services, Inc. v. Visa U.S.A., Inc., et al., in US District Court, Southern District of New York, 04 CIV 07844 (BSJ) (DFE): Economic analysis of damages from exclusionary conduct, on behalf of American Express.

Chicago Mercantile Exchange's Acquisition of CBOT Holdings.: Economic and econometric analysis on behalf of CME and CBOT before the Justice Department.

Alaska Interstate Construction, L.L.C., et al. v. Pacific Diversified Investments Inc., et. al., in Superior Court of the State of Alaska, Third Judicial District at Anchorage, Case No. 3AN-05-7921 CI.: Economic analysis of impact of contractual non-compete provisions, on behalf of Alaska Interstate Construction.

AT&T Inc.'s Acquisition of BellSouth Corp.: Economic and econometric analysis on behalf of AT&T and BellSouth before the FCC, Justice Department and various state public utility commissions.

SBC Communication Inc.'s Acquisition of AT&T Corporation: Economic and econometric analysis on behalf of SBC and AT&T before the FCC, Justice Department and various state public utility commissions.

In Re: JamSports and Entertainment, LLC v. Paradama Productions, Inc., d/b/a AMA Pro Racing, Clear Channel Communications, Inc., SFX Entertainment, Inc., d/b/a Clear Channel Entertainment, SFX Motor Sports, Inc., d/b/a Clear Channel Entertainment-Motor Sports, In the United States District Court for the Northern District of Illinois Eastern Division, Case No. 02 C 2298: Economic analysis of attempted monopolization and damages claims, on behalf of Clear Channel.

In Re: Wireless Telephone Services Antitrust Litigation, In the United States District Court Southern District of New York, 02 Civ. 2637: Economic and econometric analysis of attempted monopolization, antitrust tying and damages claims, on behalf of Verizon Wireless, AT&T Wireless, Cingular, T-Mobile and Sprint PCS.

CSC Holdings, Inc. v. Yankees Entertainment and Sports Network, LLC., before the American Arbitration Association, Arbitration Proceeding, Case No 13 181 02839 03: Economic and econometric analysis of fair and reasonable affiliate fees for Regional Sports Networks, on behalf of YES Network.

Six West Retail Acquisition, Inc. v. Sony Theatre Management Corp, et. al., In the United States District Court Southern District of New York, 97 Civ. 5499 (LAP): Economic and econometric analysis of attempted monopolization claims, on behalf of Sony.

In Re: Vitamin Antitrust Litigation, MDL No. 1285: Economic and econometric analysis of price fixing damages in the bulk vitamins market, on behalf of opt-out plaintiffs.

WorldCom, Inc.'s Proposed Acquisition of Sprint: Economic analysis on opposing merging long distance carriers before the FCC and Justice Department, on behalf of SBC and Bell Atlantic.

New Holland NV's Acquisition of Case Corporation: Economic and econometric analysis on behalf of merging manufacturers of farm and construction equipment before the Justice Department.

Riverside Pipeline Co. v. Panhandle Eastern Pipeline Co., United States District Court for the Western District on Missouri, Case No., 97-062-CV-W-4: Economic analysis of monopolization claims, on behalf of Panhandle Eastern Pipeline Co.

SBC Communication Inc.'s Acquisition of Ameritech Corporation: Economic and econometric analysis on behalf of merging local exchange carriers before the FCC and Justice Department.

WorldCom, Inc.'s Acquisition of MCI Communications Corporation: Economic analysis on behalf of merging long distance carriers before the FCC, Justice Department and state Public Utility Commissions.

In Re: Industrial Silicon Antitrust Litigation, United States District Court for the Western District of Pennsylvania, No. 95-2104: Economic and econometric analysis of price fixing damages in the industrial silicon market, on behalf of SKW Metals and Alloys, Inc.

In the Matter of Theresa Aguilar, et al vs. Atlantic Richfield Corporation et al, Superior Court of the State of California In and For the Country of San Diego, File No. 700810: Economic and econometric analysis of price fixing allegations and damages in the California RFG gasoline market, on behalf of Exxon.

In the Matter of Toys "R" Us Inc., Before the Federal Trade Commission, File No. 9278: Economic and econometric analysis of effects of vertical non-price restrictions, market power and free-riding in the toy industry, on behalf of Toys "R" Us.

In the Matter of the Arbitration Between Sprint Communications Company L.P. and Network 2000 Communications Corporation, Arbitration Case Number 57 181 0013 94: Economic analysis of damages from breach of contract, on behalf of Sprint.